Automotive Service Digest

Our 47th year

April, 1959

Who spends how much on service? See page 20.

Only Perfect Circle gives you

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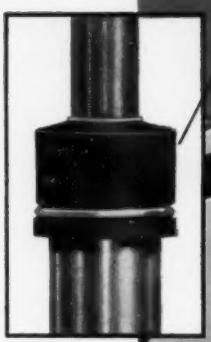
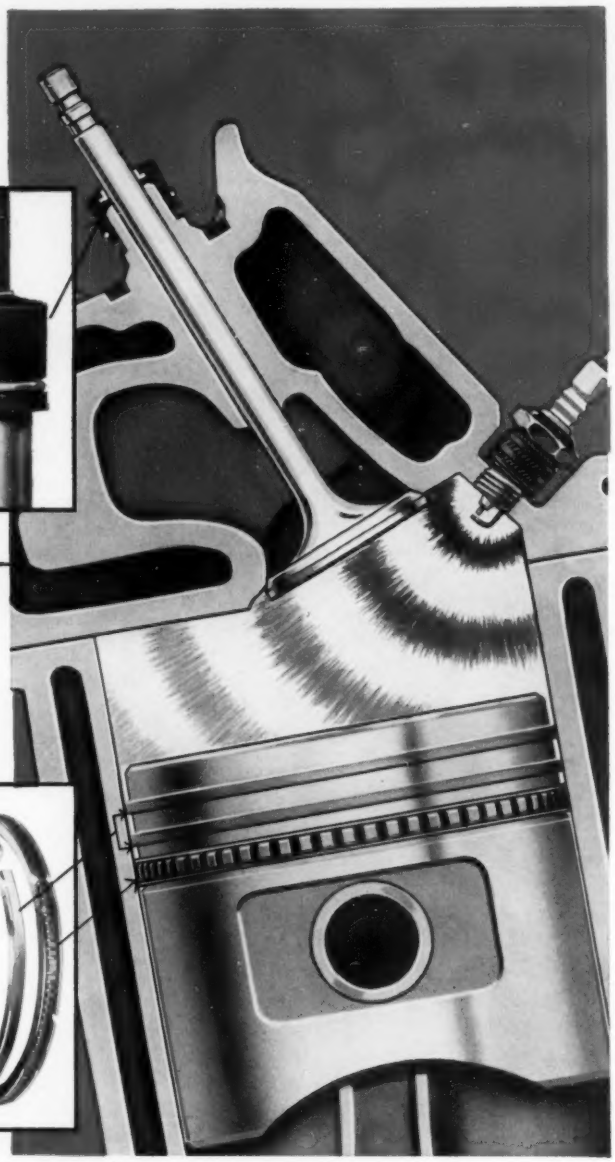
1. Perfect Circle Valve Seals



solve problem of excessive oil consumption past valves!

New rings and restored valve efficiency produce higher compression pressures—and higher deceleration vacuum. Increased vacuum draws oil through loose and worn valve guides. Stop this loss with *new* Perfect Circle Valve Seals!

Be sure of customer satisfaction—Install Perfect Circle Valve Seals on all re-ring and valve jobs.



2. Perfect Circle 2-in-1 Chrome Sets

solve problem of excessive oil consumption past pistons!

2-in-1 Chrome sets provide the finest piston rings obtainable! Top rings and oil rings are plated with thick, solid chrome. Doubles life of cylinders, rings, pistons. No tedious break-in is necessary, rings are pre-seated at factory.

Be sure of customer satisfaction—Install 2-in-1 Chrome sets for thousands of extra miles of power protection and positive oil control!

PERFECT CIRCLE

PISTON RINGS AND POWER SERVICE PRODUCTS

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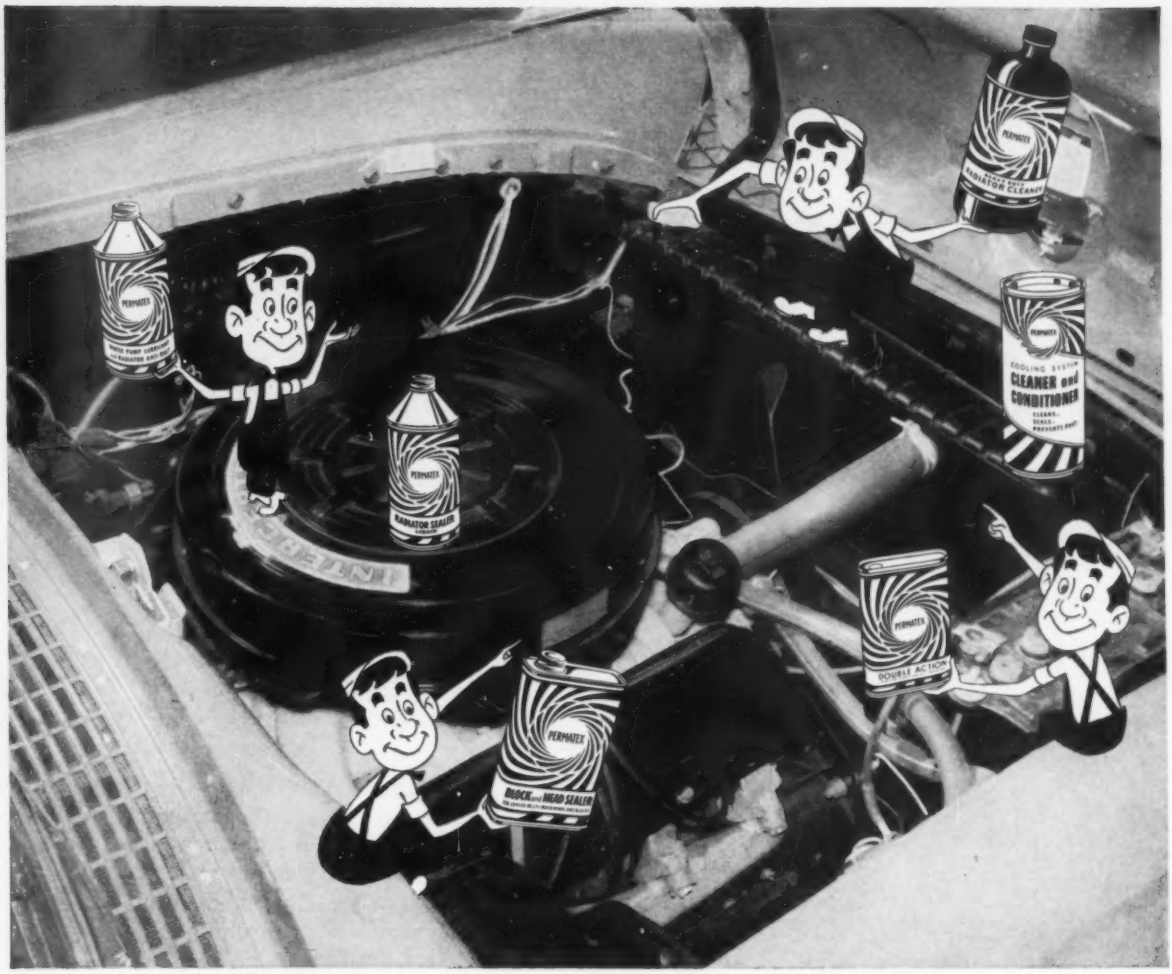

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Because half your customers need new spark plugs now . . .

New "one-plug check" gives you a fast, easy way to increase spark plug sales

And Champion's new "Check-A-Plug" card does your selling for you! It's FREE—from your Champion supplier!

Champion's new "one-plug check" program is a fast and easy way to find real prospects for spark plug service or replacement.

It doesn't take long to pull one plug. Less than *60 seconds*, in many cars. Even in the toughest car, it takes less than 3 *minutes*—with a Champion "Plug-Master" wrench and "Plug-Mate" socket!

And Champion service engineers have found that any *one* plug almost always indicates the general condition of *all* the plugs in an engine. (They've checked hundreds of thousands of plugs in thousands of cars.) Exceptions to the rule are no problem. If the plug you pull looks good, and the customer is satisfied with his car's performance, the other plugs probably *are* all right. If the plug looks bad, you pull the others anyway, for service or replacement.

"CHECK-A-PLUG" CARD

With Champion's free new "Check-A-Plug" card you don't have to worry about convincing a skeptical driver that he needs plug work. Just hold his old plug up next to the matching condition on the "Check-A-Plug" card. Chances are that's all the "sales talk" you'll need!

The "Check-A-Plug" card shows up the two most common causes of misfiring: deposits of oil or carbon on insulator tips, and electrode gaps that are too wide. And, as you know, misfiring spark plugs waste gas and power.

PLUGS REALLY NEED CHECKING

Surveys show that at least half the cars in service need new spark plugs right now. That means *every other customer* you serve! And within any twelve-month period – *all* cars need new plugs.

Champion's new "one-plug check" program is a fast, efficient way to go after this big, profitable market. And – by giving your customers the benefits of new-Champion performance – you'll be doing them a real service!

If you don't already have your free Champion "Check-A-Plug" cards, ask your Champion supplier for yours today. Then – check *one plug* on *every* car!

PS—During April and May, Champion announcements on more than 100 major radio stations across the nation will urge motorists to have their spark plugs checked.

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CHAMPION
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MATCH SPARK PLUG REMOVED TO CORRESPONDING ILLUSTRATION USING CONVENIENT NOTCH FOR FAST DEMONSTRATION
NORMAL
Indicates proper heat range. Check mileage, electrodes, gap setting.
WORN OUT
Insulator pitted, electrodes eroded—indicate 10,000 miles or more. Save gas by replacing entire set.
CARBON FOULED
Black, sooty deposit. Check for correct type. Look for rich gas mixture, ignition system trouble.
OIL FOULED
Wet, oily deposit causes misfire, hard starting. Check for correct type. Indicates excessive oil consumption.
BURNED ELECTRODES
Blistered insulator, eroded electrodes indicate plug running too hot. Check for correct type. Look for overheating troubles.
CHECK CORRECT PLUG TYPE
See Recommendations on Other Side
Form No. SC
1-59-500
Litho U.S.A.

New Champion "Check-A-Plug" card shows various conditions that call for plug service or replacement. Just hold the customer's old plug next to the matching condition on the card and let him see it. That's all the "sales talk" you need!

Champions are engineered for every car made by Ford, General Motors, Chrysler, American Motors, Studebaker-Packard, and every major foreign maker

America's Favorite . . .

CHAMPION

SPARK PLUGS

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SPRAY MOTOR CLEANER

takes you into virgin territory and the payoff is *terrific!*

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Automotive Service Digest

April 1959

Cover Subject

Is it crankcase or transmission oil that's leaking? Trio Auto Parts, Cleveland, finds the cost-saving answer to this common problem quickly. Under the high-intensity Zyglo Black Light, transmission oil is purple in color; engine oil shows up brown.

Articles

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Technical help for the service shop

Tech Know-How **articles cover how-to and what's new in approved, up-to-date shop practices, as seen and understood by men experienced in the trade.** ***Business Know-How,*** **the dollar-sign side of automotive service work;** ***Service Education,*** **the who-what-where-how of today's trade training.**

SYMBOLIZES A.S.D. "TECH KNOW-HOW" FEATURE ARTICLES

LEARN MORE EARN MORE A S D SERVICE EDUCATION

SYMBOLIZES A.S.D. "BUSINESS KNOW-HOW" ARTICLES

Instrument corner

Conducted by The Instrument Man In the interests of simpler, faster, more satisfactory—and more profitable—service operations.

The Case for the 'Scope

● CALLING ON A SHOP where the owner had shown some interest in buying an oscilloscope, the Instrument Man found that the shop man was not quite convinced he should spend the money.

He pointed out a '57 Dodge V-8 that had been brought in. "I haven't had time to get at this car yet, so suppose you show me how you'd go at it with the 'scope. The owner brought it in limping on four cylinders, and is scared to death he'll have a whopping repair bill on his hands. I'm to look it over and see what can be done, and then let him know what I find."

Instrument Man Jim hooked the oscilloscope up and started the engine, to check the ignition system. The pattern that showed on the screen was peculiar, and a little hard to interpret because it rolled and could not be "locked." Turning to the shop man, Jim said:

"Remember the three questions I told you to ask yourself on every 'scope test? First—is the pattern normal? This one certainly isn't. Second—if it isn't a normal pattern, is it the same for all cylinders? You can see here that there is a real difference on four cylinders.

"Third, you want to know what part of the trace points to trouble. In this case, you can see plainly that the disturbance is in the spark zone. That points to the spark plugs."

So the spark plugs were removed—although the owner had told the shop when he brought the car in, that he'd had new plugs put in only 4200 miles back. The plugs didn't look bad; but they were carefully cleaned, and the center electrodes were filed flat and square. After being re-gapped to spec, they were re-installed.

When the engine was started, the trace on the scope screen was just about the same as it was before. Servicing the plugs was not the answer.

Having noticed that the plugs were of the resistor type, Jim had them taken out again. He told the shop man to get out his ohmmeter and check the plugs for series resistance from the terminal to the end of the center electrode. The plugs from the cylinders that had been missing showed over 100,000 ohms resistance; whereas those from the cylinders that had been hitting normally had resistances of around 10,000 to 12,000 ohms.

"There's your answer," said the Instrument Man. "If you open up those plugs you will find that the resistor is probably powdered, making the plug almost open circuit." As the plugs that were still firing had gone as many miles as the ones that had failed, it was recommended that all new plugs be installed. The car owner was contacted, and was very much relieved when he was told that his bill would only have to cover new plugs plus a small charge for testing and installing.

With the new plugs, the engine purred like a kitten. Jim took advantage of this opportunity to tell the shop man never to take it for granted that plugs are good, regardless of how good they look, especially if they are the resistor type. That type, Jim advised, should be tested with an ohmmeter, whenever there is a question about the condition; and discarded if resistance is found to be more than 15,000 ohms.

WHY INSTRUMENT CORNER?
Because we know the help he's given so many shops first-hand is just as valuable in the re-telling as it was in the happening, we've asked The Instrument Man to pass along some of his more interesting experiences. As an old-timer in automotive servicing who is distinguished by the fact that he's kept up-to-the-minute on developments in his field, The Instrument Man gets many calls for help from friends, acquaintances and even strangers, in shops large and small. He generally solves the cases, because of his understanding and appreciation of trouble-shooting instruments.

Knew What He Wanted

As the Instrument Man stopped to make his next call, he found the shop operator talking to a customer. He overheard the customer saying that he had taken his 1957 Ford Six to a near-by shop for a tune-up, but apparently it hadn't done a very good job. The engine ran so rough when it was started up cold that at times the ignition had to be shut off to prevent the engine from being damaged.

Since he'd just had the engine "tuned-up," the customer was sure that what was needed was to have the carburetor "boiled out." A friend of his who'd had a rough running engine had his carburetor boiled out; so that must be what this car needed. The boiling out made his friend's car run much better.

Diplomatically, the shop man asked how many miles the car had been driven. Being told that it had only 7200 miles on the speedometer, he advised the customer that it wasn't time to boil out the carburetor unless it needed recalibration, which was quite unlikely. Some scientific tests should show up the cause of the trouble. More or less under protest, the customer finally agreed that this made sense.

Both to convince the customer and to check the ignition system, the oscilloscope was hooked up. The trace on the 'scope screen indicated that the trouble was *not* in the ignition system; so further testing was necessary. A vacuum gauge was connected, and with the warmed-up engine running a little rough, it showed a fairly steady vacuum gauge reading of 17.5 in. Knowing that a leaking intake manifold could cause trouble, the shop man squirted a little engine oil around the manifold to check for leaks. Immediately the vacuum jumped up to 21 in. as the oil temporarily sealed up the leaks.

After the manifold nuts were

(*Continued on page* 12)

since 1956...

nearly **70%**

of America's most expensive and most popular cars* were initially equipped with Expander-type wheel cylinder cups!

since 1956...

MILLIONS of "E" Series HRC* CUPS *WITH EXPANDERS* have been used as replacements on America's most expensive and most popular cars!*

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BY HERB CARRIER
Detroit Editor

Spokes from the "hub"

• 1959 BUG PARADE. Nothing it seems—even the multi-million-dollar test racks used by all auto manufacturers — can duplicate the mass owner-operator testing in actual driving conditions. New models have been on the road long enough to reveal some interesting bugs . . . as evidence the following subjects of recent service bulletins.

* * *

Flying lead! Some mechanics have been having a terrible time making wheel balance weights stay on the wheels. The answer, according to a Dodge Technical Service Bulletin lies in the fact that 1959 wheel covers are designed to cover the wheel completely—including the rim flange. Wheel cover fasteners now engage the outer lip of the rim flange, rather than the bead seat on the step of the flange (the method used on previous models). This set-up won't accommodate standard wheel weights.

Special wheel weights which properly fit the wheel and cover, eliminate this problem. They are available from Wheel Weights, Inc., as the "9000" series; Bear Manufacturing, the "C" series; MoPar in six part numbers, 1940813-J through 1940818-P. Help keep our highways clean by using the right weights where '59 covers are the "coverall" type.

* * *

Doggy Pontiacs. Those '59's that apparently have no "poop" may be suffering from incorrectly set ignition timing. *Pontiac Craftsman* calls attention to the fact that the vacuum hose must be disconnected from the carburetor while the timing is being adjusted. The 1959 distributor has full vacuum advance at engine idle. Failure to disconnect the vacuum hose during timing adjustment will result in very poor performance and fuel economy.

Properly timed the '59 Pontiac is one of the hottest stocks on the road.

* * *

Flicker, flare and flutter. Some '59 Chevrolets have been blowing hot and cold in the headlight department . . . a cycle of varying brilliance that is obviously a voltage problem. According to a Chevrolet Technical Service Bulletin:

Headlamp flicker on some 1959 passenger cars is a condition attributed to oxidation of the voltage regulator contact points. Regulators built in September, October, November of 1958 (identified by date codes "8J," "8K" or "8L"), may have remained unsealed in storage for an abnormally long period of time. Consequently, the contact points may have oxidized. The condition will not result in electrical system failure, nor reduce the life of any parts; but it may cause the headlamp to flicker that is annoying to some owners. To eliminate the condition, replace the regulator. Those built prior to September '58 and during January '59 should be OK.

* * *

Patchy plating. Effective January 6, 1959, a liquid wax protective coating applied to all external plated parts became standard procedure on American Motors cars. Normally, this coating is removed during pre-delivery inspection, by a good scrubbing with a household washing detergent—such as "Rinso Blue" or "Oxydol" in hot water.

Sometime after delivery, the surfaces may take on a dull, hazy appearance, which indicates to some owner that the plating is defective. "Not so!" says an American Motors Service Bulletin: it's just that the protective wax was not completely removed. It can still be removed, but due to weathering, it may have toughened to the point where a cleaner stronger than household detergent is required. In this case, the bulletin recommends, use "Johnson's Kleen Floor," available locally. Here's how: following directions on the container, and with the solution as warm as can be conveniently handled, apply it to the plating. Let soak several minutes; then wash off by ordinary car washing methods. (Don't fail to get your trading stamps when buying the cleaner — Smart shoppers save!)

* * *

On the mark, set, no go! Even a flat-wing bomb flattens out horribly when ignition timing is retarded eight degrees. Approximately 685 of the 1959 Dodge Division "B" engines were produced with an incorrectly located ignition timing mark. This location error results in an eight degree retard from where the setting appears to be . . . results in poor fuel economy, engine surge or lack of performance.

As reported by a Dodge Technical Bulletin, the engines affected are serial numbers ML361-11915 through ML361-12290 and ML383-6273 through ML383-6579. No six-cylinder or 326-cu. in. engines are involved.

To establish the proper timing mark, the bulletin recommends removing the No. 1 spark plug and bringing the piston to top dead center, compression stroke (TDC can be checked with a suitable dial indicator type tool: Dodge tool Number C-3075). With piston at TDC, the crankshaft dampner should be marked with a flat blade chisel, producing a new dampner mark exactly opposite the TDC mark on the timing chain case cover indicator. Paint the new mark in white, and cover the old, incorrect mark with black paint.

* * *

Confused color code. The four-way power seat on the 1959 Mercury isn't always powered in the right direction. On some installations, the seat moves in the direction opposite to that indicated by the switch. For example, when the switch is pressed downward, the seat moves upward; and when the switch is pressed upward, the seat moves downward. This slight technicality can be embarrassing and uncomfortable for some persons.

To correct it, a Mercury Service Bulletin recommends reversing the seat motor field wire leads as follows: connect the **red** wire from the seat motor to the **yellow** wire from the seat motor relay; the **yellow** wire from the seat motor to the **red** wire from the seat motor relay. With the seat properly wired, four-way operation is a comfortable convenience.

CONTROL!

and in trucks, tractors, and cars OIL CONTROL

with Sealed Power KromeX Piston Ring Sets with Stainless Steel Oil Rings

Stainless steel oil rings are the reasons America's largest engine builders are using Sealed Power rings as original equipment.

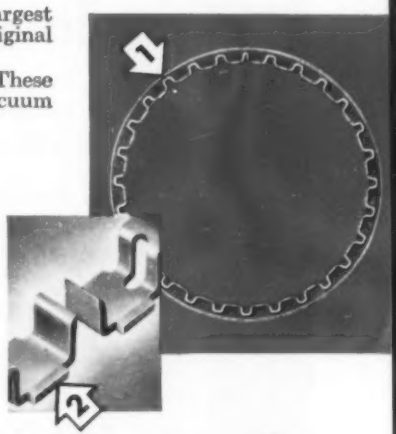
New design . . . new material . . . fully tested! These rings come in fast, control oil even under high vacuum conditions or in tapered and out-of-round bores.

Just one of the reasons why . . .

They hold their fit in the cylinder bore. Sealed Power stainless steel oil rings are self-expanding. The new end abutment design gives them the greatest flexibility ever built into an oil ring.

When compressed in the cylinder, the correctly engineered number of spring tension points provide uniform outward pressure—without any back-up springs or shims (*see arrow 1*).

An equal number of sturdy shoulders supporting each steel rail produce complete contact with the cylinder wall (*see arrow 2*).



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You get all these features with the GLOLITE television clock...

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This is a special limited time offer! Ask your wholesaler about the special Auto-Lite promotional plans using this clock to help you increase your spark plug sales.

Order now—any assortment of 50 Auto-Lite Spark Plugs—and get this valuable premium.

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Designed for rugged, continuous service in transport trucks and heavy duty farm equipment.

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Auto-Lite Resistor Spark Plugs give long life, quick starts, and smooth performance. Suppress spark plug interference with radio and TV reception.

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Used by leading manufacturers as original equipment in outboards, mowers, saws, and garden tractors.

POWER TIP

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*Suggested price to dealer.

AUTO-LITE® RESISTOR SPARK PLUGS WITH POWER TIP

THE ELECTRIC AUTO-LITE COMPANY • TOLEDO 1, OHIO

Instrument Corner . . .

(*Continued from page 6*)

tightened the engine began to run as smoothly as could be expected, much to the pleasant surprise of the car owner. Analyzing the situation, the shop man figured that when the engine was cold there was considerable leakage around the manifold, and it would run very roughly. But as it warmed up, the leakage became less and the engine ran somewhat better, though not satisfactorily.

With the manifold properly tightened the leaking condition was corrected, so with no parts required, and only the labor of making the tests and tightening the manifold nuts, a condition that seemed quite serious to the owner, was corrected.

After the customer left, the shop man greeted the Instrument Man and asked him what he thought about the way the customer and the job were handled. Jim complimented him on both.

Three important points, the Instrument Man explained, had been illustrated by the event. First—listen carefully to what the car owner says, but don't take it to be the whole story. Second—Be sure the work you sell is good, and corrects the trouble. Third —Remember that intake manifold leaks are fairly common and can cause a very rough running engine.

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can be accurately used with
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Patented pivoted handle fixes load position
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The Value of Interpretation

As the Instrument Man was on his way to another one of "his boys," he noticed a car ahead of his that was having trouble. It would run along then almost stop, then go ahead jerkily. As it came to the shop Jim was headed for, it turned into the driveway and its horn sounded loudly. As the shop door opened, the car crept in. Jim parked outside, and then entered.

The car, a 1957 Oldsmobile, was running on what sounded like two cylinders, though actually it was later found that only four were missing. The owner was quite upset about the way the engine was running, and was afraid there was a big repair bill ahead of him.

The Instrument Man greeted the shop operator and told him, "Bob, this is a case for the oscilloscope. I'll bring one in, and we'll hook it up and see what it shows." So he got the instrument out of his station wagon and made the necessary connections. The 'scope pattern looked good as far as the ignition system was concerned, and this was pointed out.

But it also indicated that there was trouble in cylinders No. 1 and No. 7 on the left bank and No. 4 and No. 6 on the right bank. On Oldsmobiles, the left cylinders are numbered 1, 3, 5, 7, and the right cylinders are 2, 4, 6, and 8, starting from the front. Therefore, the missing cylinders were the two end ones on the left and the two middle ones on the right. These are the ones supplied by the left bank of the four barrel carburetor.

"What does that tell you?" the Instrument Man asked.

"Looks like carburetor trouble to me," was the reply.

"I think so too," Jim told him, "but call me if you need help."

He went on his way but checked back later to see what was found in the carburetor. When it had been removed for examination, it was found that there was a restriction on the left side which thinned out the air-fuel mixture enough to cause four cylinders to miss. Replacing a jet and cleaning it out corrected the difficulty; and when the carburetor was replaced the engine ran as well as ever.

To this shop man, the job had certainly proved the value of knowing about engine design, operation of the four barrel carburetor, and how to interpret correctly the information given by observation and testing.

In shops where they do not believe in testing, and where parts are changed promiscuously in the hope of hitting on the one that causes the trouble eventually, the job could have cost the car owner $50.00 or more. As it was, the cost was only for the actual time it took to make the tests, and to correct the trouble in the carburetor. This handling of the job made a firm friend of the customer, in addition to giving the shop man the satisfaction of having done an efficient and technically correct job. A by-product was the customer's good will and word-of-mouth advertising that this shop is a good place to go to, as they "know their stuff" and are "square shooters."

It Could Happen to You

A car owner had been plagued with constant misfiring for several months, in spite of a new carburetor, fuel pump and ignition parts. The number seven spark plug fouled repeatedly, but compression, valve action and tappet settings were apparently normal.

Not until the valve spring itself was removed for checking could the source of trouble be seen. One broken piece of the spring had interlocked sometime during previous tune-ups and the tappets had been adjusted to take up the slack.

Moral: Valves and valve mechanisms should always be carefully checked when trouble shooting. (*Courtesy Champion Spark Plug Co.*)

Proper Lubrication Makes Shifting Easier

Gearshifting difficulties may be avoided in vehicles equipped with manual transmissions, especially those subjected to heavy-duty service, by lubricating the steering gear gearshift lever at 10,000 mile intervals.

To properly lubricate the lever, Plymouth Service Division recommends removing the rubber boot and pivot-pin assembly from the gearshift lever located under the steering wheel. Then remove the gearshift lever and apply lubriplate to the ball end with pivot-pin hole and the area surrounding it. Replace the gearshift lever, pivot-pin assembly and rubber boot.

Lark Hood Release Fails

A recent Studebaker Service Letter reports that under certain conditions the hood lock control conduit on 59S-59V Lark Models may slip toward the hood lock. This will reduce the travel of the hood lock control to a point where the hood lock cannot be released.

To correct this condition, the factory recommends sawing a slot in a 1" long piece of 5/32" or 3/16" steel tubing and fitting it around the hood lock control wire, closing the slot in the tubing by squeezing the tubing together with a pair of pliers. Then remove the hood lock control anchor clip. Before anchoring the hood lock control, however, position the conduit so that 1" to 1⅛" of hood lock control wire travel is available before the stop is reached. Then anchor the conduit, using a new clip (Part No. 1331825).

Willys Has Kit to Remedy Pedal Side Movement

On older vehicles, wear of pedals and shaft and/or friction bushings, permits side movement of the brake and clutch pedals. Where this slack has become excessive, Willys recommends the use of a newly released pedal slack adjuster kit.

Separate kits are available for the Universal Jeep ,Kit No. 921936) and the Utility Vehicle (Kit No. 911937). When installed (in about 15 minutes, according to the factory), the kit provides additional adjustment to compensate for further wear.

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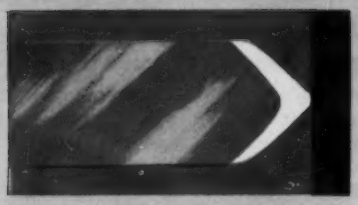

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Hastings Rings are covered by
U. S. Patent Nos. 2148997, 2511874, 2565042, 2712971

Editor's page

'Miking' the shop's markets

● CAREFUL MEASUREMENT of parts—checking them out with a micrometer for maximum accuracy—is common practice for shop operators. The findings dictate subsequent decisions and procedures in doing a satisfactory service job on the customer's car.

Similarly precise 'miking' of business prospects is equally important to a service shop—in its own best interests. For sound, usable and timely marketing information is as necessary to an automotive businessman as technical improvements and the possession of property, equipment and goods.

Admittedly, great strides have been made in better automotive shop practices and equipment; but these may prove profitable only if service sales keep pace. That's where marketing data are indispensable . . . in pointing out who spends how much for what, and in which localities expenditures are biggest.

From the findings of market studies, shop operators can gain a sound basis for either (1) maintaining the status quo or (2) making changes dictated by the facts brought into sharp focus by up-to-date economic information.

LIFE's Study of Consumer Expenditures, which serves as the basis for this month's feature interview, "Who spends how much on service," illustrates the point clearly. It covers contacts with a representative sample of more than ten thousand U. S. households, and gives in dollars, what households spend in each of eight general categories. In this, automotive expenditures rank third highest.

This 'miking' of consumer spending shows, further, that the suburbs of metropolitan areas are the automotive shopman's most lucrative hunting grounds. For example, the study reveals that household expenditure for automotive service averages $92 annually in the suburbs of major metropolitan areas—53 per cent greater than the second highest, which is $60 annually for households in minor metropolitan areas.

Other equally significant and important information, bearing directly on selling automotive service, was brought to light in the LIFE research program. To the shopman who will take the trouble to study and use them, these market facts can be road markers toward a more profitable route for automotive service business in any section of the country.

As our interviewee, Dr. Ostheimer points out: "The more any business knows about the size and nature of the market for its products or services, the sounder basis there is for necessary decisions and plans."

Ben Ikert
EDITOR

Bearings . . . the jewels of suspension

Wheel bearings are among the most important components of a modern automobile. Delivering vital service with a minimum of attention, properly installed and lubricated precision bearings are truly mechanical catalysts in the process of converting combustion to motion.

By HERB CARRIER
Detroit Editor

• WHEREVER CAR WHEELS rotate, bearings are working. From the relaxed pleasure of a Sunday drive to a speed run on a packed-sand beach to a hub-deep plunge through Northland snow, wheel bearings provide a guiding, friction-reducing link between torque and traction.

To do their job, wheel bearings must efficiently handle several operational conditions, and combinations of these conditions. First, they must support the entire weight of the vehicle and its load and still offer minimum rolling resistance. Wind resistance and road surface resistance generally contribute more drag on vehicle motion than do wheel bearings.

While in motion, wheel bearings must be able to withstand sudden and often severe impact loads caused by the wheels striking holes or objects in the road. At the comparatively high speeds of modern transportation, these impact shocks can pack terrific wallops.

In addition, wheel bearings — especially front wheel bearings — are called upon to effectively resist extremely heavy thrust loads incurred when the vehicle negotiates turns. High speed cornering can place tremendous thrust forces that must be counter-acted by the wheel bearings. While handling cornering thrust, wheel bearings must also maintain pre-set front end alignment within very close tolerances.

Finally, rear wheel bearings must absorb the entire torque output of the engine; again, without undue friction or resistance. When differential action occurs—one rear wheel spinning on ice, snow or mud—the bearings on the other wheel must handle *all* torque transmitted through the power train.

As can be appreciated, wheel bearings have a big job to do. Consequently, they must be carefully designed and superbly constructed. Proper installation and lubrication are equally as important as quality manufacturing. Bearings need the best to give the best.

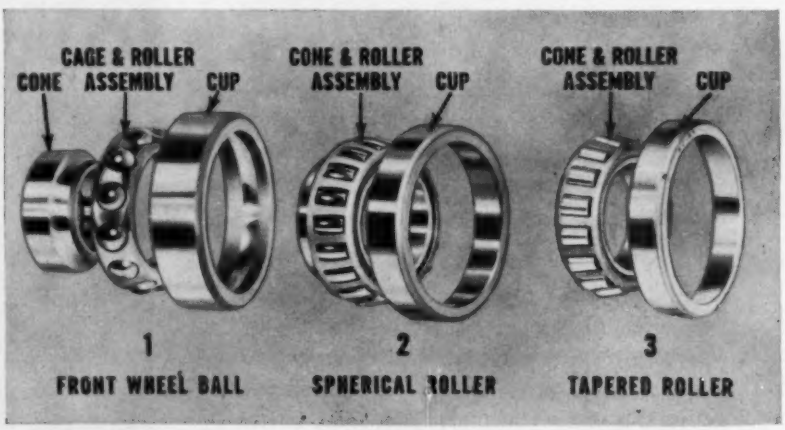
FIVE BASIC TYPES

There are five popular types of wheel bearings in general use. Individual types are usually determined by the shape of the actual bearing roller. Also, bearings are classified as separable, non-separable, adjustable, and non-adjustable.

By types, the following terms are usually applied:

1. Front wheel ball bearing.
2. Spherical roller bearing.
3. Tapered roller bearing.
4. Rear wheel radial ball bearing.
5. Straight cylindrical roller bearing.

The first three types each consist of a cone, cage and roller assembly, and a cup. The ball bearing type has each of these units separate and separable. The roller bearing types usually combine the cage and roller assembly with the cone. This type bearing is also separable, but it separates into only two parts—the cone and roller assembly, and the cup. (Cups are often referred to as raceways or races.) All three types are adjustable so that



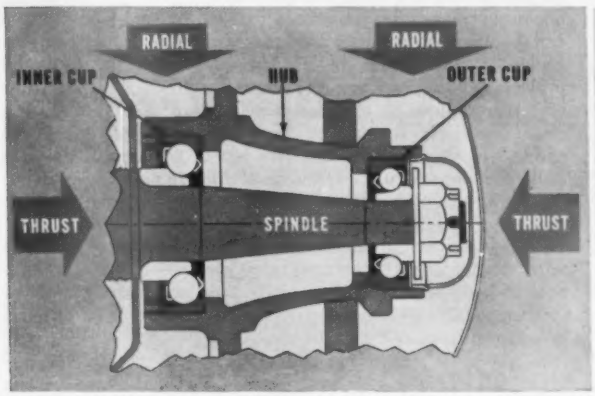
The front wheel ball bearing, the spherical roller bearing, and the tapered roller bearing are the three most common bearings used on modern suspension systems. These bearings are also classed as separable and adjustable.

internal running clearance between the bearings and their cups can be accurately adjusted for maximum performance.

The radial ball bearing and the straight cylindrical roller bearing are for rear wheel application. These types consist of the same basic units, but they are non-separable and non-adjustable. The proper internal running clearances are built-in during manufacture.

BALL BEARING APPLICATION—FRONT WHEEL

Standard manufacturing application for front wheel use calls for two bearings on each wheel. These bearings are called the *inner* and the *outer* bearings. The inner bearing—the one toward the center of the vehicle—supports thrust loads from one direction; the outer bearing—the one furthest away from the center line of the vehicle



On ball bearing applications for front wheel use, the inner bearing is designed to support thrust forces from one direction, and the outer bearing supports thrust forces from the other direction. Both bearings support the radial load.

—supports thrust forces from the opposite direction. Both bearings support the radial load.

The inner bearing cone is shaped and extended to provide a smooth sealing surface for the oil seal. To insure an effective seal, the sealing surface on the bearing cone is machine ground to close limits.

Bearing cups are a press fit into the wheel hub, and are designed to rotate ith the wheel. The bearing cone assemblies are slip fit onto the stationary wheel spindles. This slip fit allows the bearing cone assemblies to creep or slowly revolve around the spindle, thereby increasing bearing life by more equally distributing the loads applied.

ROLLER BEARING APPLICATION—FRONT WHEEL

Roller bearings enjoy wide popularity in the automotive field, especially tapered roller bearings. Taper refers to the fact that the rollers are smaller on one end than they are on the other. A spherical bearing closely resembles a tapered bearing except the spherical roller is larger in the middle than it is on either end.

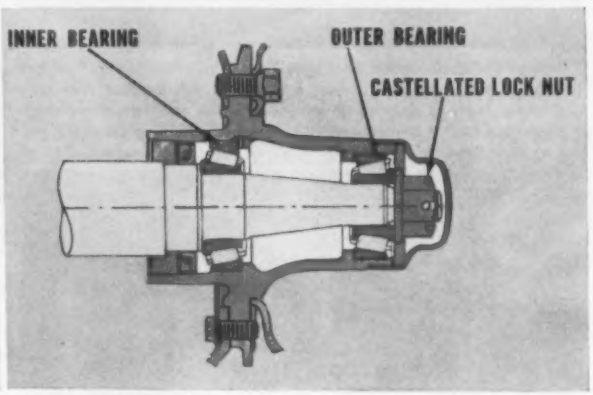
In front wheel application, tapered roller bearings are mounted two to a wheel, so that their small ends point downward and toward each other. Carefully machined flanges at the large ends of both bearing cones prevent the bearings from being forced out of their races when subjected to heavy thrust forces. These flanges also offer important alignment action to properly control the accuracy of the rolling wheel.

Tapered roller bearings are also popular for rear wheel application. A single bearing is mounted with a press fit on the outer end of each axle shaft and rotates with the shaft. The bearing properly locates the shaft and supports the radial loads at each rear wheel. Other types of bearings are sometimes found on passenger car rear axles, but the tapered roller is by far the most common.

DAMAGING FORCES

In theory, a properly designed, well lubricated, and correctly installed wheel bearing will have extremely long life. It's not unusual to find such a bearing in good condition after a hundred thousand miles of use. There are, however, many operating conditions that can greatly reduce the life expectancy of even quality bearings.

Abrasive is, perhaps, the number one enemy of a precision bearing. Because a good quality bearing is machined to operate at small, carefully controlled clearances, minute particles of foreign matter can cause severe



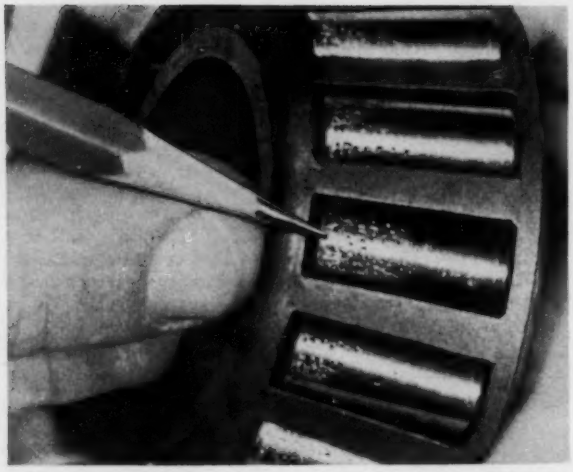
Tapered roller bearings closely resemble ball bearings in application. Once bearings are properly adjusted for exact running clearance, the adjustment is maintained by use of a castellated nut and cotter pin.

damage if they are allowed to enter the working areas of the bearing and raceways. Dirt and dust mixed with the bearing lubricant actually act as lapping compound which can quickly wear away enough bearing metal to cause comparatively rapid failure. This is because the bearing clearances are extremely close. Even tiny foreign particles will tend to grind metal when permitted to enter the bearing assembly.

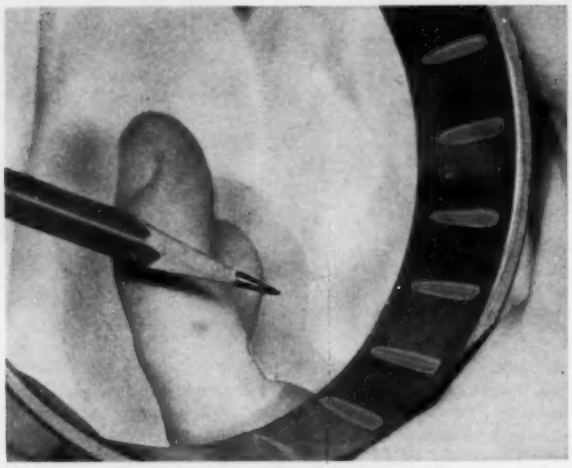
Larger particles of abrasive dirt or metal can work their way into bearing assemblies and actually wedge between bearing and raceway. This, in turn, can cause either or both press fit bearing cups to rotate with the bearing rather than remain stationary. This results in overheating and eventual failure. Absolute cleanliness is imperative during bearing handling. On the manufacturing level, elaborate precautions are constantly taken to insure the exclusion of all foreign matter in the installation of original equipment wheel bearings, and in the packing and packaging of replacement wheel bearings. In-service handling should be just as meticulous.

GOOD HANDLING TECHNIQUES

In the factory, finished bearings are washed in filtered oil to remove every particle of dirt, dust, and other foreign material. Then they move through special filtered-air driers which remove all moisture. Immediately after being dried, they are coated with the correct type and amount of bearing lubricant. Finally, they are wrapped in moisture-proof paper and placed in close-fitting storage boxes. They should never leave the boxes until they are ready to be installed on the vehicle. Almost without ex-



Flaking or spalling at the small end of the tapered roller bearings indicates too loose a bearing adjustment. Usually this same type of damage is present on the corresponding position of raceways.



Brinelling, a series of regularly spaced indentations on the inner surface of the raceway, indicates an overly tight bearing adjustment. It can also be caused by unusually severe impact shocks due to wheels striking road holes or objects while car is traveling at high speeds.

ception, any impurities that enter bearing assemblies are introduced during the installation and adjustment procedures.

To protect factory-built cleanliness, always clean off the work bench and surrounding area *before* starting any kind of bearing work. Cover the bench top with clean wrapping paper. Clean the tools to be used, and check them carefully for splintered handles or mushroomed heads. Damaged tools can drop harmful particles without being noticed. Handle new or used bearings with a clean lint-free cloth. Be sure, also, that hands are reasonably clean. At least they must be free of all grit and grime.

Perspiration alone from even the cleanest hands can start damaging rust. The conscientious mechanic just can't be too careful when performing bearing work.

A new bearing, after being removed from its carton, should be placed on the clean bench paper and covered with another piece of clean paper. This will keep out air-borne dirt and dust. Never wash or remove the grease or oil applied on a new bearing by the manufacturer. It's exactly the right kind and the right amount of lubricant for that particular bearing. A new bearing can be removed from its container and installed directly on the wheel.

In repacking a serviceable bearing, use only clean grease. Do not allow the supply of wheel bearing grease to lay around the shop without being adequately covered. Grease from an uncovered container may do a bearing more harm than good. Incidentally, when repacking a bearing, always completely remove the old grease. Not all wheel bearing greases are compatible. Some have a lithium base, others a sodium base. Mixing the two can bring on problems. The safest way to avoid error is to remove all old grease.

CLEANING PROCEDURE

After removal from the wheel, place the bearings in a container filled with clean solvent or kerosene. Soak the bearings to remove the caked grease. An old paint brush can be used to scrub away the stubborn accumulations. Swish the bearings in the solvent regularly to shake loose deposits. Remove the bearings from the container and place them in another similar tank also filled with clean solvent. Rinse the bearings by swishing them around in the solvent near the top of the container. Use only the upper third of the fluid for rinsing purposes as the removed particles tend to fall out and settle in the bottom of the container.

After a thorough cleaning and rinsing, dry the bearings with blasts from a compressed air hose. The air line should be fitted with a moisture trap and a filter. Water in the air line can cause damaging rust to form on the bearing and raceway surfaces.

Never spin a bearing with compressed air. And never rotate or turn a bearing for inspection purposes until it has been thoroughly cleaned. Either instance can cause serious bearing damage.

The same general cleaning technique can be applied to all separable bearings, bearings with shields or seals on one side only, or bearings with removable type seals. However, never wash or attempt to repack a fully shielded or fully sealed bearing. These are pre-lubricated at the factory and require no further periodic service.

INSPECTION TECHNIQUE

Once properly cleaned, the bearings are ready for inspection. Inspection calls for locating any bearing assembly damage, and diagnosing its cause. Only by determining what caused the damage can the mechanic avoid reoccurrence of the same damage to the replacement bearing. The inspection technique should be meticulous and should follow a set pattern so that all areas of failure will be completely covered in all bearings. The step-by-step inspection procedure can be performed in any sequence that is in keeping with personal work habits. Regardless of which check comes first or last, the complete inspection should reveal any signs of the most common kinds of bearing damage as well as any unusual conditions which may occur in specific applications. As a guide, typical types of bearing failure follow, each condition being identified as to the cause of failure:

Excessive wear: Dirt, bearing's most deadly enemy, is the biggest single cause of premature failure due to excessive wear. The result of foreign matter in the bearing lubricant acting as lapping compound shows up as rough, dull-looking bearings and raceways. Pit marks and indentations may often appear over the entire bearing and raceway surfaces.

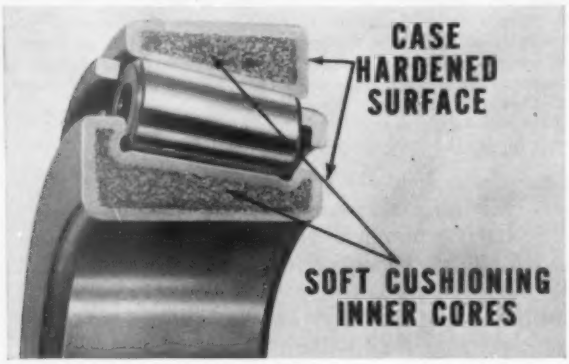
Obviously, if a bearing fails because of dirt the entire bearing areas should be thoroughly cleaned before replacement bearings are installed. Hubs and housings

should be washed with clean solvent, and seals should be replaced. Taking out the defective bearing and slapping in a new one without a good cleaning allows the same condition to repeat itself. This isn't fair to the customer or to the mechanic's reputation as a skilled craftsman.

NOTE: A light, frosted appearance is normal for many bearings. It's the rough, pitted condition of the bearings and the raceways that indicate excessive wear caused by dirt.

Spalling: A chipping, crumbling effect on the small ends of tapered roller bearings is another common occurrence with bearings that aren't properly installed. Spalling on the small ends of the rollers and on the corresponding areas of the raceways indicates excessive running clearances, or too loose bearing adjustment. Proper adjustment avoids this type of failure.

Fractures: Fine hairline cracks across the surface of the cup or cone occurs whenever the bearing assembly has been subjected to undue strain from improper application. The most common examples of this condition are forcing bearing assemblies on oversize spindles, or forcing cups into a warped wheel hub. Fractures can also result by improperly seated cones or cups.



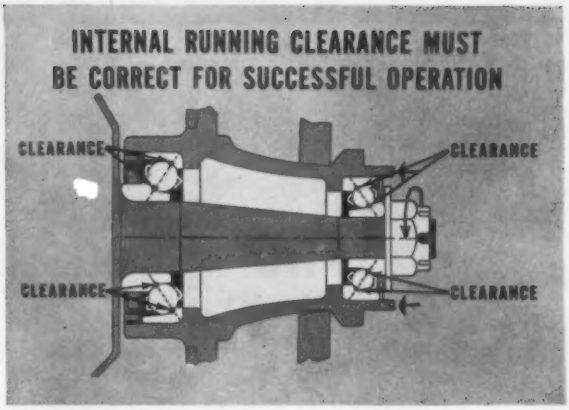
During installation, never strike the narrow section of the tapered roller bearing cups with a hammer or a drift punch. These parts are designed to have a case hardened outer surface and a soft cushioning inner core. Sharp blows with a metallic object can cause the case hardened surfaces to crack and chip.

Brinelling: A series of indentations running around the inner surface of a raceway in a definite pattern indicates severe impacts have squeezed the rollers into the metal of the raceway damaging both components. Improper mounting of raceway or bearing assembly, or unusually violent road shocks can cause this condition.

Corrosion: Deep pits or pock-marks on the bearing assembly or the raceway are most likely due to chemical action caused by moisture entering the bearing areas and contaminating the lubricant. Moisture usually gets into the area by slipping past a defective seal. It's not unusual to trace corrosive moisture back to defective handling. Perspiration itself is extremely corrosive.

When corrosion is evidently the cause of bearing failure, thoroughly clean the bearing area, replace the seal, and handle the replacement bearing with a clean, lint-free cloth during replacement installation.

Overheating: Blue or brownish-blue bearings are the result of overheating. This can be caused by abrasive dirt, foreign particles wedging a bearing in its cage, lack of lubrication, or a too tight bearing adjustment. Clean handling, proper lubrication, and correct adjustment must



The reason for adjustment is to accurately establish the correct running clearance between bearings and raceways. These clearances are critical and must be correct to within a few thousandths of an inch.

be applied to the replacement bearing. Also the bearing area must be thoroughly cleaned of all old grease.

End Wear: Spalling or excessive wear at the large end of tapered roller bearings is most often caused by too tight an installation adjustment. Again, the bearing area should be thoroughly cleaned before replacement installation, and the replacement bearing properly adjusted.

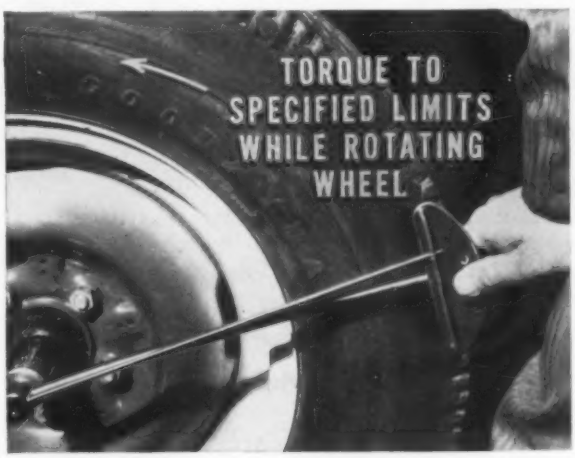
Fatigue: Pit marks, non-localized spalling, and flaking on bearings and raceways indicate failure due to general fatigue caused by a combination of all previously discussed conditions. Or, it could be due to normal wearing out after a long life of efficient service. Fatigued bearings should be replaced with all the care and caution used in replacing other defective bearings.

REPLACEMENT

Any bearing or raceway that shows signs of damage or impending failure should be replaced. Separable bearings should be replaced in complete sets. Never replace only the bearing or raceway. It's also accepted practice

(Continued on page 76)

It's very important to torque the front wheel bearing adjusting nuts to specifications *while slowly rotating the wheel.* This slow rotation guides the bearings into their cups and also allows the mechanic to check for excessive drag caused by brake shoes or oil seals.



Who spends how much on service?

Interview*

By BEN M. IKERT
and
GEORGE A. WHITTINGTON

RICHARD H. OSTHEIMER, Director of Market Research of LIFE magazine, was formerly the economist on the research staff of the Commission on Financing Higher Education. Previously Dr. Ostheimer, who holds both an M.A. and Ph.D. in Economics from Columbia University, was an Instructor in Statistics at Columbia College. He has also served as a consultant to the National Science Foundation. He is the author of *Student Charges and Financing Higher Education*, published by the Columbia University Press in 1953.

• WHICH MOTORISTS in the neighborhood of an automotive service shop are most likely to become good repeat customers? Are there enough of them in the immediate area to support a good shop operation? If there aren't enough potential customers today, is it likely that there will be more in the neighborhood soon? On the other hand, what are the chances that a shop with more business than it can handle now, may not have enough to keep its doors open within a few years?

Any automotive service shop owner or manager could plan his future much more soundly—to put it mildly—with the answers to these questions. In fact, those answers could very well permit him to avoid economic disaster, and to succeed "big" instead.

Finding and recognizing good prospects for any product, is as important to the businessman who sells it as having the right product and knowing how to close a sale. Whether it's automotive service or washing machines, there's no chance to "sell" the customer until he's located and identified, of course. Yet there's a limit to how long the seller can afford to search for the right persons and places.

Fortunately, modern marketing has developed ways to shorten the search drastically. Today's market research can give the automotive service shop operator the information he needs to answer the questions raised above—for himself and for his own particular situation.

No crystal ball is needed to provide shopmen with knowledge far more accurate and dependable than "hunch," intuition or the fabled "eye for business" that successful men are said to have.

What is required, however, is access to a collection of hard facts, scientifically gathered and analyzed. For this kind of business treasure, your editors turned to LIFE Magazine, which a short time ago electrified the marketing field with its great "Study of Consumer Expenditures."

We are deeply indebted to LIFE and its Director of Market Research, Dr. Richard H. Ostheimer, for the interview that follows. It is based on the results of the famous study, of course, and Dr. Ostheimer has drawn freely on LIFE's files for information of direct interest and value to ASD readers. Some of the details he reveals about Automotive expenditures had not been previously released, and are published for the first time in this exclusive interview.

* * *

Question: Why has the LIFE Study of Consumer Expenditures aroused so much interest among marketing men throughout the country?

Answer: The LIFE study provides a wealth of information on "Who spends how much for what." It is based on interviews with a representative sample of 10,243 U. S. households, and permits projecting a nationwide picture of how the public spends its dollars for a wide range of products and services.

Our results give the average number of dollars per year that American households spend in each of eight broad categories of goods and services. Within

*One of a continuing ASD feature series.

How the average household divides an annual expenditure of $4,100 between eight categories of goods and services. "Automotive" is third largest, exceeded only by food-beverages-and-tobacco, and home operation-and-improvement.

each of the eight, averages are given for household dollars spent on specific kinds of products and services. Going further into detail, the study shows the differences in spending between households that vary in characteristics such as income; age, education and occupation of the head of the house; stage in the life cycle (households with a young head and no children, households with children of different ages, households with older head, etc.); location (central city, suburb, rural area); geographic region.

Question: What was the objective of the study, Dr. Ostheimer? What did LIFE intend to accomplish by gathering this information?

Answer: This study is a step towards providing American business with current marketing information previously unavailable. There is a need for more knowledge of this kind if sales methods are to keep pace with technical improvements in production. The over-all purpose of the LIFE Study of Consumer Expenditures is to describe the market for the various goods and services which consumers buy.

Question: How can businessmen use the results of the study?

Answer: When the current market facts are analyzed and interpreted, they can serve as the basis of specific marketing decisions. With knowledge as to which groups of consumers account for most of the purchases of a given type of product, for example, a manufacturer or retailer can develop advertising or promotion material that appeals directly and strongly to such persons. As another example, the relationships of household characteristics to spending can help in estimating sales potential.

Question: We're interested, of course, in one particular group of businessmen: the owners and operators of car dealer or independent automotive service shops. Will the information you've obtained help these people to build their business better?

Answer: I believe it can. The more any business knows about the size and nature of the market for its products or services, the sounder basis there is for necessary decisions and plans.

Question: Generally speaking then, Dr. Ostheimer, would you say that the automotive service shop can "shape up" better selling strategies by using some of the findings of the LIFE study?

Answer: Yes. There is a good deal of information in the Automotive category that should be useful in the day-to-day operation, and the long-range management plans, of an automotive service shop.

Question: Going back to the study as a whole, would you give us a brief "run down" on how it was made?

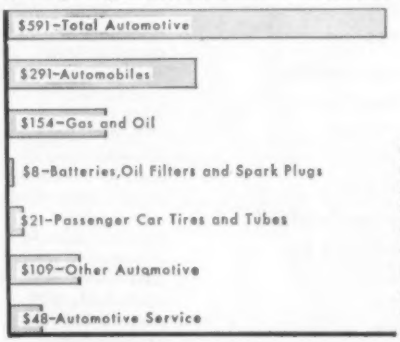
Answer: As you know, the survey was conducted entirely by Alfred Politz Research, Inc. To meet the objective of defining the market for most goods and services bought by consumers, the study was designed to obtain data on their annual expenditures directly from them. At the same time, a great deal of information was gathered about the characteristics of the households surveyed, so that the consumers could be evaluated as customers.

Information was collected from each household in four interviews, or "waves," spread over a thirteen-week period. Interviewing went on throughout the fifteen months from October 1955 to December 1956. From October through October, some 200 new households were added to the sample each week.

The average sample household was interviewed a total of eight hours, spread through the four "waves." Highly trained interviewers worked under close supervision and quality checks, using established, scientifically sound techniques to minimize the possibility of error. On the fourth visit, or "wave," the interviewer left a household record, in which all household expenditures for the following ten days were entered. The interviewer returned twice during that period, on the fourth and the sev-

How Households Spend Automotive Dollars

Average expenditures, all U.S. households



How the average household spends its $591 within the Automotive category. Of the $109 identified as "Other Automotive," $48 goes for necessary service work.

enth days, to check over the entries and encourage correct and complete recording. He picked up the completed record on the tenth day. Household records were obtained for the 52 weeks of 1956. Data on automotive service outlays were obtained in this way. Expenditures for durable goods such as automobiles, which are more easily and accurately recalled for long periods, were covered through regular interview questions requiring recall of up to 12 months.

Question: What kinds of household spending are covered in the study?

Answer: The eight major types of expenditures covered by the study are: food, beverages and tobacco; clothing and accessories; home operation and improvement; home furnishings and equipment; medical and personal care; automotive; recreation; and other.

In Volume One of the study, more specific expenditure categories have been analyzed within each of these; for example, under automotive: automobiles; passenger car tires, tubes; batteries, oil filters, spark plugs; gasoline, oil; other automotive.

Because the aim of our study was to provide information to the marketer of consumer goods and services, certain kinds of expenditures were excluded. Among these are spending away from home while on vacation, gifts and contributions, and educational and capital expenditures.

Question: In broad terms, how do American households split their dollars among the eight categories?

Answer: The survey shows that the average U. S. household spent $4,106 annually for the goods and services that were measured, or a total expenditure of over $200 billion by the more than 49 million households in existence at the time of the study.

For the categories, the averages were: food, beverages and tobacco, $1,203; clothing and accessories, $494; medical and personal care, $222; home operation and improvement, $763; home furnishings and equipment, $344; recreation and recreation equipment, $214; automotive, $590; other goods and services, $276.

Automotive expenditures, you will note, are the third highest category of consumer spending.

Question: How do various household characteristics "show up" in this spending picture?

Answer: Income is the most dominant influence of course; expenditures become consistently larger with higher incomes. Accordingly, upper-income households account for far more than a proportionate share, based on their numbers, of total purchases of most goods and services. Automotive spending is one of the categories most influenced by higher income. Households with an income of more than $5,000, which amount to 34 per cent of all U. S. households, account for 50 per cent of spending in the Automotive category.

However, as the distribution of income becomes more equal and as more and more households rise above the level of subsistence, income becomes less of a force in determining consumption and other factors assume greater importance. Among the non-income characteristics that affect expenditures markedly are education, stage in the life cycle, location of the dwelling (whether it is non-metropolitan or in a metropolitan area, and if in the latter, whether in the city or the suburb).

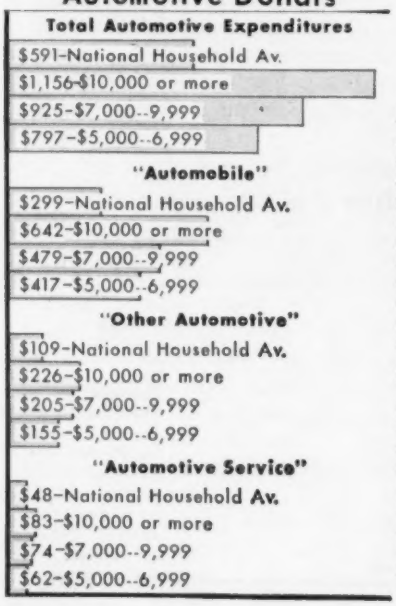
Question: Within the "Automotive" category, Dr. Ostheimer, how are the budget dollars spread? Can LIFE's figures give any clues to those dollars expended specifically on service—including parts and labor?

Answer: The national household average of $590 spent in that category is divided as follows: $299 for the purchase of automobiles; $8 for batteries, oil filters, spark plugs; $154, gasoline and oil; $21, passenger car tires and tubes; $109, other. Our figures show that of the $109 identified as "other automotive," $48 is spent on automotive servicing, repairs and parts (other than batteries, oil filters and spark plugs), and car washes.

Question: This means that households spent some $2.3 billion in the aggregate on that kind of automotive servicing during the period LIFE studied. That figure doesn't take into account expenditures during vacation, when many a car shows its true condition and is serviced along the way.

What can you tell the service shops, Dr. Ostheimer, about who spends these service dollars?

How Households Spend Automotive Dollars



Differences in Automotive spending between households of different income. While higher income is marked by larger expenditures, the difference in spending is not in direct proportion to income. Note that the "$10,000 or more" household has at least 50 per cent more income—yet spends only 33 per cent more on Automotive Service than those households with from $5,000 to $6,999 income.

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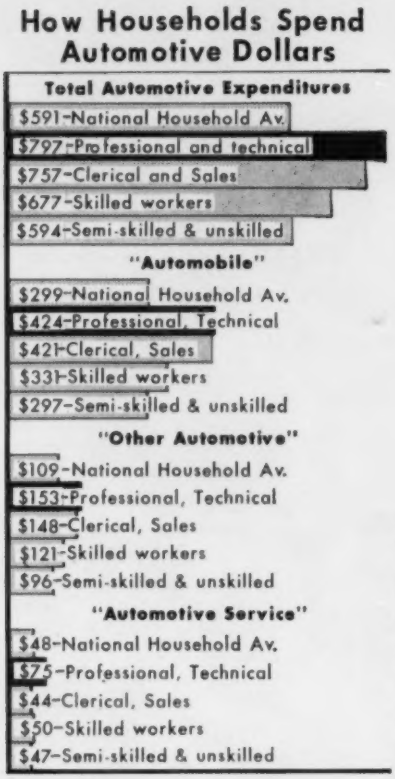
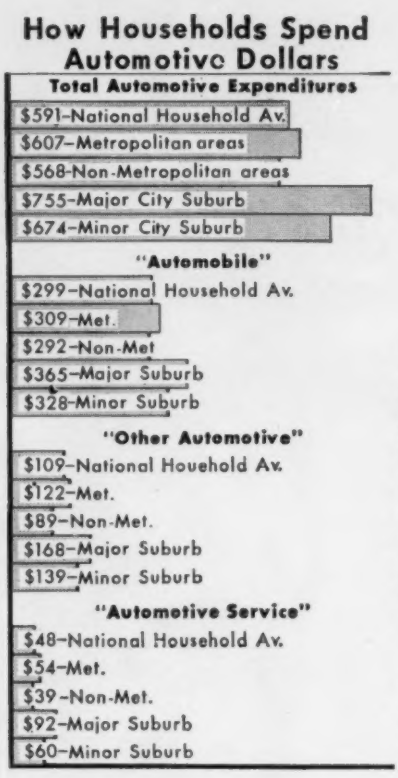


How households headed by persons of different occupations compare in various Automotive expenditures. Note that spending is consistently higher for households in which the head is a professional or a technician.



Comparison of the average spending of households in different market locations. Major cities and suburbs are in areas that have cities with 500,000 or more inhabitants; minor, in areas without a city that large. Note the markedly higher expenditures by households located in the suburbs—particularly the suburbs of the major cities.

Answer: We can look at spending patterns as they vary with the various household characteristics that were taken into account in gathering this information. As I explained earlier, the expenditures were analyzed by seven household characteristics: stage in the life cycle; income; age, education and occupation of the household head; market location of the household; and geographic region.

Expenditures by households under these classifications show some differences that should be very interesting and suggestive to automotive service shop management.

Question: What kinds of households spend the most dollars, on the average, for servicing?

Answer: In the classification by income, households reporting $10,000 or more appear as the "biggest spenders," averaging $83 for automotive servicing, compared to $48 for all households.

Comparing expenditures in relation to education of the head of the household, we find those with "some college or beyond" spending the most, an average of $70. Households headed by a professional or semi-professional person have the top figure, $75, in the occupational analysis. Interestingly, the second highest average is $70, for those headed by a farmer or farm laborer. The only other expenditure higher than the average for all households is $50, where the head of the house is in the "craftsman, foreman" (skilled worker) category.

Comparing spending for automotive servicing on the basis of the age of the household head, we find the 40-49 bracket having the highest average, $60. "Stage in the life cycle" figures show the highest figure, $69, associated with households having a head under 40 and no children present. Where children more than 10 years old are in the household, and include both boys and girls, we find the second highest average expenditure, $55.

The most dramatic differences in expenditures are found in the comparison by market location of the household: those in the suburbs of major metropolitan areas average $92—a figure more than 50 per cent greater than the second highest, $60 for households in minor metropolitan area suburbs.

Question: Which households now account for the largest dollar volume of spending on automotive servicing?

Answer: Comparing households by the income characteristic, this spending parallels the general figures for automotive expenditures as a whole: the 34 per cent of households with income of $5,000 or more account for 49 per cent of the dollars spent on servicing.

Considering the educational background of the household head, we find that those who have finished high school and those who have had some college or beyond account for 42 per cent of households, while the households they head do 51 per cent of service spending.

As far as age is concerned, the 45 per cent of all

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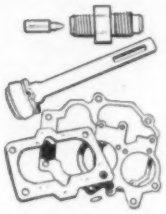

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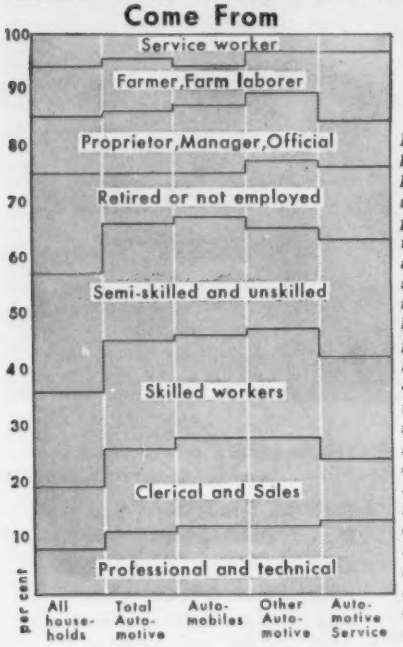
Who spends how much on service? . . . (Continued from page 24)

households which were headed by persons in the 30-49 bracket spend 55 per cent of the dollars.

Question: From your findings, Dr. Ostheimer, is it possible to help the service shopmen recognize sales opportunity by "drawing a picture" of the motorist who would be "Mr. Best Prospect for Service Work"?

Answer: Unfortunately, no. The data needed to do this are not available. The best we can do in this respect is to point out that motorists most likely to be good prospects would be from households having the characteristics associated with higher than average expenditures. There are certainly many valuable indications in the information on income, occupation, location, education and stage in the life cycle.

Where Automotive Dollars Come From



Households headed by farmers, farm laborers and persons in skilled, professional and technical work, are above-average sources of service dollars. Combined, they are 34 per cent of all households; spend 44 per cent of the total for automotive service. However, the bulk of expenditures—50 per cent—comes from the 49 per cent of households headed by persons in skilled, semi-skilled, unskilled, clerical and sales occupations.

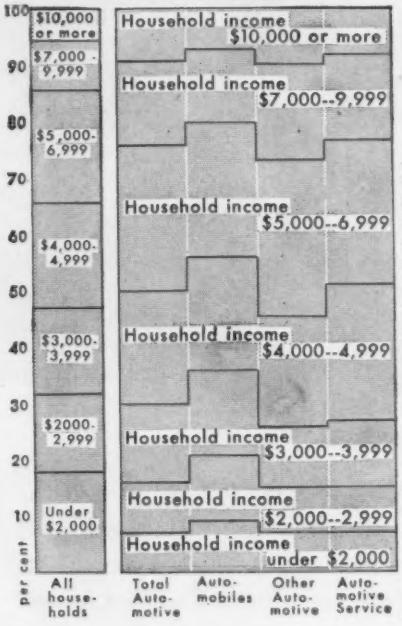
Stage in the life cycle seems particularly influential as far as your interest is concerned. Notice for example, the figures on households with "children over 10 only." In the life cycle comparison these have the highest average expenditure, $747, for the automotive category as a whole. They are also second highest in automotive service spending as such, $55, within this grouping.

These households make up only 16 per cent of all those in the country, yet account for 21 per cent of automotive spending as a whole and for 19 per cent of automotive service spending. Households with older children only also represent 29 per cent of the one-out-of-eight households owning two or more cars.

Question: Do your results give any clues as to where a service shop is most likely to find business good? It would certainly help shop owners to know what kind of a location offers the best potential business volume.

Answer: Our results certainly indicate that the highest potential volume is in metropolitan areas, particularly the suburbs, with the suburbs of major cities ranking highest. Households in the suburbs of major cities have the highest total average expenditures in automotive as a whole ($755) and in automotive service ($92). They make up 15 per cent of all U. S. households, yet they account for 29 per

Where Automotive Dollars Come From



Average household income among prospects is a sound guide to service sales potential. Note that the 34 per cent of households that have an annual income of $5,000 or more account for 50 per cent of all automotive spending . . . and 49 per cent of expenditures for service work. Of all "service dollars," 73 per cent come from the 53 per cent of households with income above $4,000.

cent of automotive service expenditures.

Suburban households in metropolitan areas with cities of less than 500,000 are 12 per cent of the national total but represent 15 per cent of service expenditures.

Question: How does the future look for the automotive service business? It is bound to increase of course, with growth in population and more cars on the road. But are there other trends now apparent that will have a direct effect on the service field; and if so, what are they and how are they likely to influence this field?

Answer: There are several apparent trends that

FRAME & BODY NEWS

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New Portable Equipment Cuts Time on Collision Jobs in Half

Tops most bulky ramp-type racks for versatility, ease of use

For years, body shops have wanted this seemingly impossible combination of features in collision repair equipment: Big rack power and strength *without* the space-killing size of bulky ramps and heavy gear . . . light-weight, easy-to-use tools to save job time *without* sacrificing safety and equipment life . . . ability to exert push or pull at any spot on any part of the frame or body — under the car, inside or outside the body — *without* complicated, cumbersome set-ups.

Now, for the first time, the "impossible" has been done. John Bean's new Portable Frame Straightener and Body Press does many jobs in half the time most of the latest, widely advertised racks can do them . . . and does work easily that no other portable units can do.

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On *frame work* this is the first and only portable equipment that can do push or pull work under the car . . . correct combination stretch and sag . . . make diagonal diamond corrections . . . apply squeezing action . . . and make diagonal side-sway adjustments without removal of body metal.

On *body work* only these John Bean units can apply either push or pull at heights up to 76" . . . do roof pull-downs or push ups from inside the car and square up the body in all directions without removing upholstery . . . correct glass openings, roof sections, floor, cowl and rear deck areas . . . and do *combination body and frame set-ups* at one time.

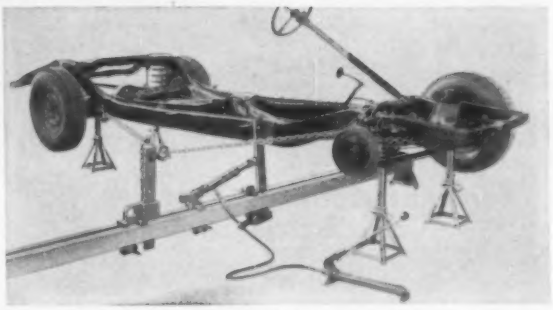
More power, more strength, more safety

On top of unequalled versatility, you get full rocker bar power efficiency. Because of the bar unit's unique pivoting action there is no waste of power through the usual friction loss caused by sliding beams.

Special, high tensile, alloy steel permits small, light weight tool design for speed and ease of set-up, yet these tools have the strength and durability for constant use with little maintenance.

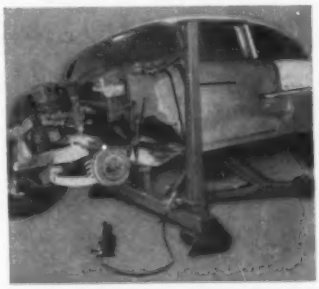
Every tool is safety engineered. All John Bean frame clamps, plates, etc. attach to the tool bars with clevis and pin . . . no hooks to slip and fly off. Jack locks have an exclusive, serrated rocker bar with double the gripping power of other makes.

The complete facts on this revolutionary development in frame and body work is worth your careful study. Send for details today.



FULL SIDE SWAY CORRECTION from underneath car is shown above. (Frame stripped for illustration purposes.) Note simplicity of set-up and portability of all tools.

DIAGONAL PULL on cowl section is shown at right to illustrate ability of this body press to exert pull at any angle or any height. No need to move the car; you save shop time by bringing the equipment to the work.



ROOF PUSH-UP, above, illustrates a roof panel raise. Same application can be used for applying lifting pressure to any part of body. Not necessary to remove seats, upholstery, or trim.

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Who spends how much on service? . . . (Continued from page 26)

will probably influence automotive service business very markedly in the direction of increased business. Of these, you would probably be especially interested in the changes that are to occur in the education and occupation of the household head, location of the household, and its stage in the life cycle.

Question: Families with older children have certainly shown up as relatively good automotive service customers in your figures. How will this group be affected by expected shifts in "stage in the life cycle" among households nationally?

Answer: While it is difficult and risky to make forecasts concerning the stage in the life cycle generally, it is clear the greatest growth in the next few years will be in the number of households whose youngest child is aged 10 through 19. The increase is expected to amount to 50 per cent of the 1956 figure by 1965. This would mean 12 million such households, compared to eight million in 1956, and implies a substantial rise in service outlays on this account.

Question: LIFE's study shows that among occupations, the "professional, semi-professional" group has the highest average dollar expenditure on automotive servicing. How are these occupations expected to fare between now and 1965 as compared to the outlook for other categories?

Answer: The Department of Labor expects that by 1965 the number of professional and semi-professional workers will increase by one-third. Skilled and semi-skilled workers will increase by one-quarter; while the number of unskilled workers will decline.

Associated with changes in the occupational distribution of the labor force will go changes in levels of educational attainment. In 1956, 42 per cent of all household heads had graduated from high school. By 1965 we expect that half of the nation's households will be headed by a person who at least finished high school. Many of these, of course, will also have attended college.

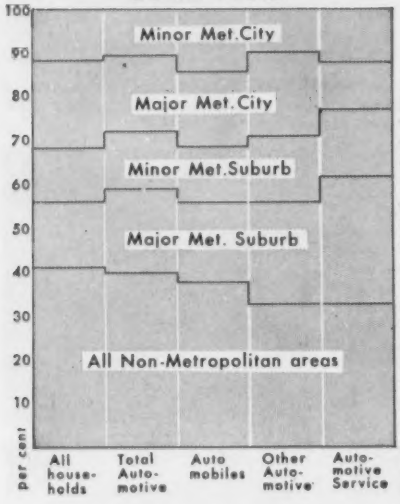
Question: You've shown too, Dr. Ostheimer, that households in metropolitan areas account for about two-thirds of all automotive service spending, and particularly that suburban households have the top average dollar expenditures. How will the next few years affect the movement toward the cities and suburbs?

Answer: One of the most definite population trends we know of is the growing importance of the suburban portions of our metropolitan areas. Indications are that by 1965, 65 per cent of the nation's households will be located in metropolitan areas, compared to 59 per cent at the time our study was made. The trend toward the suburbs themselves is even more marked; the proportion of households located there is expected to increase one-quarter. Of all households, 34 per cent will be suburban, compared to the 27 per cent of 1956.

* * *

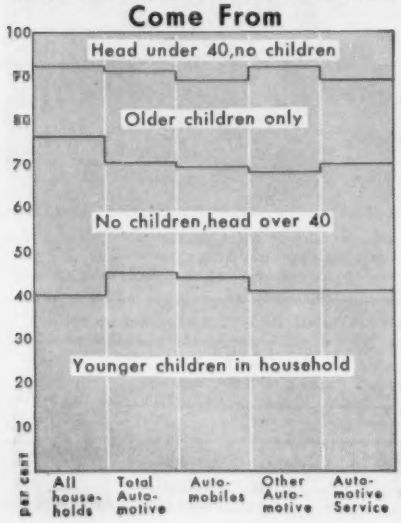
Automotive service shops can make immediate and profitable use of the kind of information so ably presented by Dr. Ostheimer. He has given them dependable "yardsticks"—based on the spending habits of motorists themselves—for measuring the potential volume of business. Future issues of ASD will also feature valuable "Know-How" of this kind, in interviews with other research authorities on the findings of major market studies.

Where Automotive Dollars Come From



That suburban car owners spend for automotive service far out of proportion to their number, is dramatized in this comparison. Only 27 per cent of all households, those that are in the suburbs spend 44 per cent of automotive service dollars. "Minor Met." areas have no cities of 500,000 or more; "Major Met." cities are that large or larger.

Where Automotive Dollars Come From



Comparing households by their stage in the "life cycle" is especially interesting to shops with an eye on the future. Note that while those with younger children (under 10 years old) are more numerous and also account for a bigger share of automotive spending, households with older children only are responsible for more than their proportionate share of expenditures.

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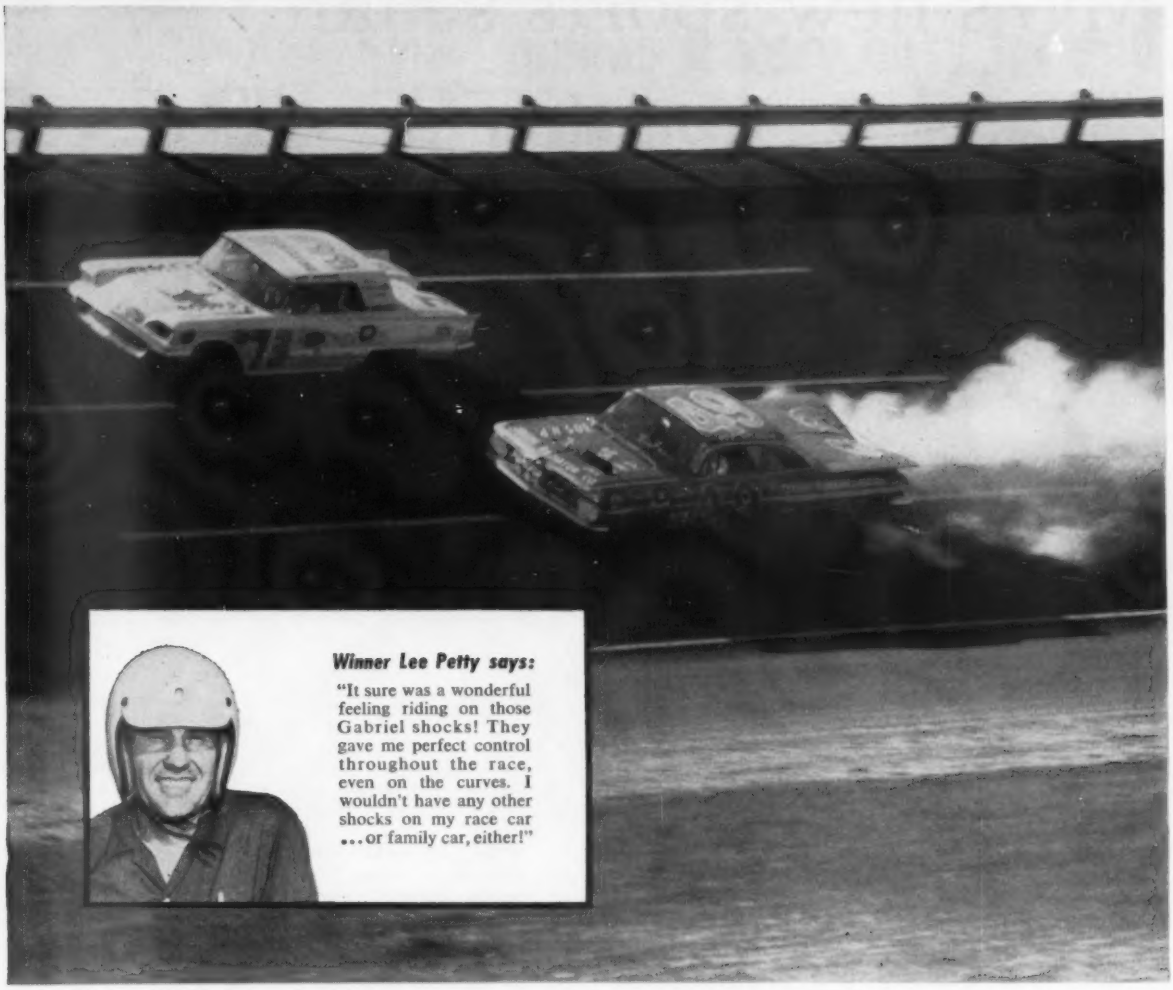

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• LONGER, LOWER, SLEEKER than its predecessors in the line, the new MG Magnette Mark III was unveiled in the American market recently as a "lovelier, livelier sedan with a sports pedigree" by British Motor Corporation, Ltd. A medium price family car, it combines a new body style by stylist Pinin Farina of Turin with the famous MG sports car engine.

"Restrained" tail fins, claimed a first in imported sports sedans, are a style feature. Other fashion features are wide, wrap-around windshield and rear window, and a modification of the traditional MG grille to permit a low sloping hood.

PLUSH COMFORT INSIDE

In addition to providing more elbow and leg room, the Mark III's interior has an accent on elegance. Front seats are independently adjustable; seat cushions are thick foam rubber. Upholstery is hand-rubbed English leather; dashboard and door cappings are of polished grained walnut veneer, while the floor covering is deep pile carpeting. Both upholstery and carpeting can be obtained in colors to match or contrast a wide selection of exterior finishes.

Grouped within easy reach of the driver are an illuminated electric clock, a large lockable glove compartment, switches for heater and windshield washer—all standard equipment.

SAFETY EMPHASIS

In keeping with an MG tradition, the Mark III has up-to-date provisions for the protection of driver and passengers. Projecting edges of the dashboard and parcel are foam-rubber padded. All doors are fitted with zero-torque locks and catches that prevent accidental opening from inside. Safety glass is used all around; dash lights are hooded against reflection in the windshield, and non-reflecting leather covers the dashboard.

SPORTS PERFORMANCE

With its 1489 c.c. "B" type BMC engine and dual carburetors, the new Magnette "steps out" in traffic. It accelerates from 10 m.p.h. to 70 in 19.5 seconds.

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ENGINE: 4-cyl. OHV, liquid cooled; aluminum-alloy pistons; 2.875-in. bore, 3.5-in. stroke; 66.5 b.h.p. at 5200 r.p.m.; compression ratio, 8.3:1.

IGNITION: battery and coil; automatic advance and retard with centrifugal and vacuum control.

CARBURETION: twin S.U. automatic downdraft carburetors fed from rear tank by S.U. electric pump.

TRANSMISSION: single-plate dry clutch, hydraulically actuated; 4-speed gearbox, synchromesh in top three gears; central floor gear shift; three-quarter-floating rear axle.

BRAKES: hydraulic, fully compensated; 9-in. diameter drums front and rear.

BODY-CHASSIS: mono-construction body shell, floor, bulkhead and frame members.

SUSPENSION: front—independent coil spring and wishbones, hydraulic piston-type dampers; rear—semi-elliptic rubber-mounted springs and piston-type hydraulic dampers.

ELECTRICAL EQUIPMENT: high-output generator with compensated voltage control; 12-v 58-amp.-hr. battery; double dipping sealed beam headlights; separate sidelights; twin stop and tail lights; dual arm, self parking windshield wipers; high beam and turn signal warning lights; reverse indicator light.

INSTRUMENTS: speedometer with trip and total distance recorders; fuel gauge; oil gauge; ammeter; engine temperature indicator.

DIMENSIONS: overall—length, 14 ft. 10⅛ in.; height, 4 ft. 11¾ in.; width, 5 ft. 3½ inches. Wheelbase, 8 ft. 3-3/16 in.; front track, 4 ft. and ⅞ in.; ground clearance, six inches.

An international compromise in styling and in sports car—family sedan performance, is British Motor Corporation's description of its new Magnette Mark III. Styled by Pinin Farina of Turin, the four-door sedan has sports-tuned OHV engine; clocks up to 90 m.p.h.; is somewhat roomier inside than previous Magnettes. Interior features hand-rubbed leather upholstery.

"HOW-TO-DO-IT" installation sheet makes it very easy for you to do brake relining jobs...

Wagner® Lockheed LINED BRAKE SHOES come with installation instructions in every set

Now, Wagner makes brake relining work easier and more profitable for you.

Wagner furnishes "HOW-TO-DO-IT" Installation Instructions with every set of lined brake shoes. It's simple for any mechanic to handle brake relining jobs.

Wagner Lockheed Lined Brake Shoes come to you with the lining contour ground to compensate for normal drum distortion. With correct clearance provided towards the ends of the shoe, lining contacts the drum over most of its surface. This feature assures jobs that give safer, smoother stops. You have less grief—there will be fewer "free adjustments—and you'll make more money.

WAGNER SHOE EXCHANGE PROGRAM lets you take full advantage of Wagner's production facilities when you exchange shoes. The slow, tedious job of delining and relining the shoes is eliminated. Sets that come to you from the Wagner Supplier consist of clean, inspected, completely reconditioned shoes equipped with the right premium quality lining.

In addition to the exchange shoe program your Wagner Supplier offers sets made up with top-quality lining on all-new shoes, packed one axle set to a box. Sets with Wagner "WP" Lining are extensively used on high horsepower passenger cars and commercial vehicles equipped with or without automatic transmissions and power brakes. Sets are available with either standard or over-size thickness—for all popular passenger cars and some light trucks.

In addition to sets, the Wagner line includes friction materials in blocks, rolls, slabs and cut segments—providing the right lining for every job.

The complete Wagner line not only consists of brake lining, but includes hydraulic brake parts, fluid, and power brake repair kits.

FOR DETAILS consult your nearest Wagner Supplier, or mail coupon to us for FREE copy of CATALOG BU-579.

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When the object of inspection is to safeguard both the customer's life and his pocketbook, the shopman wants to be certain to save and re-use sound parts; detect and discard defective ones. For this—and also to cut its own costs—many a service establishment finds that . . .

"Black light" is "bright" in shop work

• REPORT of a "new wrinkle" in shop use of the Zyglo method is a recent "straw in the wind" as to the growing importance of non-destructive testing in up-to-date automotive servicing.

According to Trio Auto Parts, Cleveland, two of its toughest problems have been licked by the black light-plus-penetrant method. The firm specializes in rebuilding automatic transmissions. It had always found it difficult to locate the source of leaks that could be either in the engine or the transmission; and to make certain that there were no leaks in rebuilts.

In the first case, a wrong guess could mean taking a transmission apart in a vain effort to find a leak, which would later turn up in the engine. Leaking rebuilt units meant lost time and extra cost, since the firm's policy is to guarantee its work. This happened often enough to cause the owners serious concern.

SCIENTIFIC SOLUTION

Today, Trio uses the high-intensity Zyglo beam on the underside of cars brought in (see cover illustration), to determine the source of any leak. The appearance of the oil under the black light gives the answer: transmission oil appears purple; engine oil, brown.

Parts that go into rebuilt transmissions are sprayed with Zyglo penetrant on one side; then inspected on the other side under black light. Penetrant soaks through and reveals even the tiniest leak in brilliant yellow, according to Sam Melamed, partner in Trio.

"The test seems actually foolproof," he says. "This is the first time we've been able to be sure that a rebuilt unit has no leak."

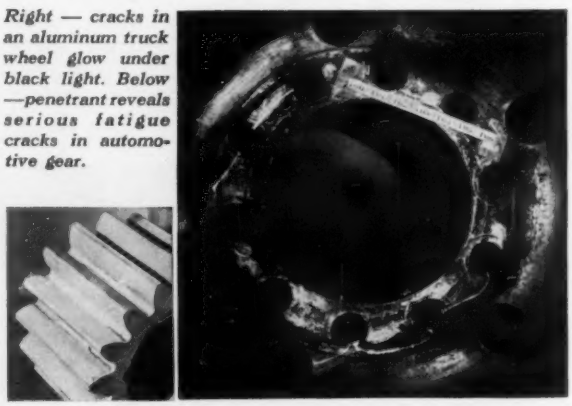
This shop's experience is a good example of the usefulness of the method; and of today's increased need for quick, reliable non-destructive inspection techniques. Modern automotive design features thinner sections of material, in line with higher strength-to-weight ratios; and more precise fits, stemming from increased complexity in parts and systems. Increasing popularity of non-magnetic materials—aluminum, magnesium, cements, plastics, for example—adds to the shop problem in determining the condition of key parts.

SIMPLE, EFFECTIVE PRINCIPLE

Penetrant-and-black-light methods permit the shop to locate any defects open to the surface, in virtually any type of material—quickly and with a high degree of certainty. In fact, if the correct penetrant is selected from among the many available, the detection of cracks is practically certain.

Four simple steps are involved. A suitable penetant is applied to the surface by dipping, spraying or brushing (it is drawn into any breaks by capillary attraction); surface is washed clean of remaining penetrant, and treated with a wet or dry developer. The developer draws the penetrant back to the surface.

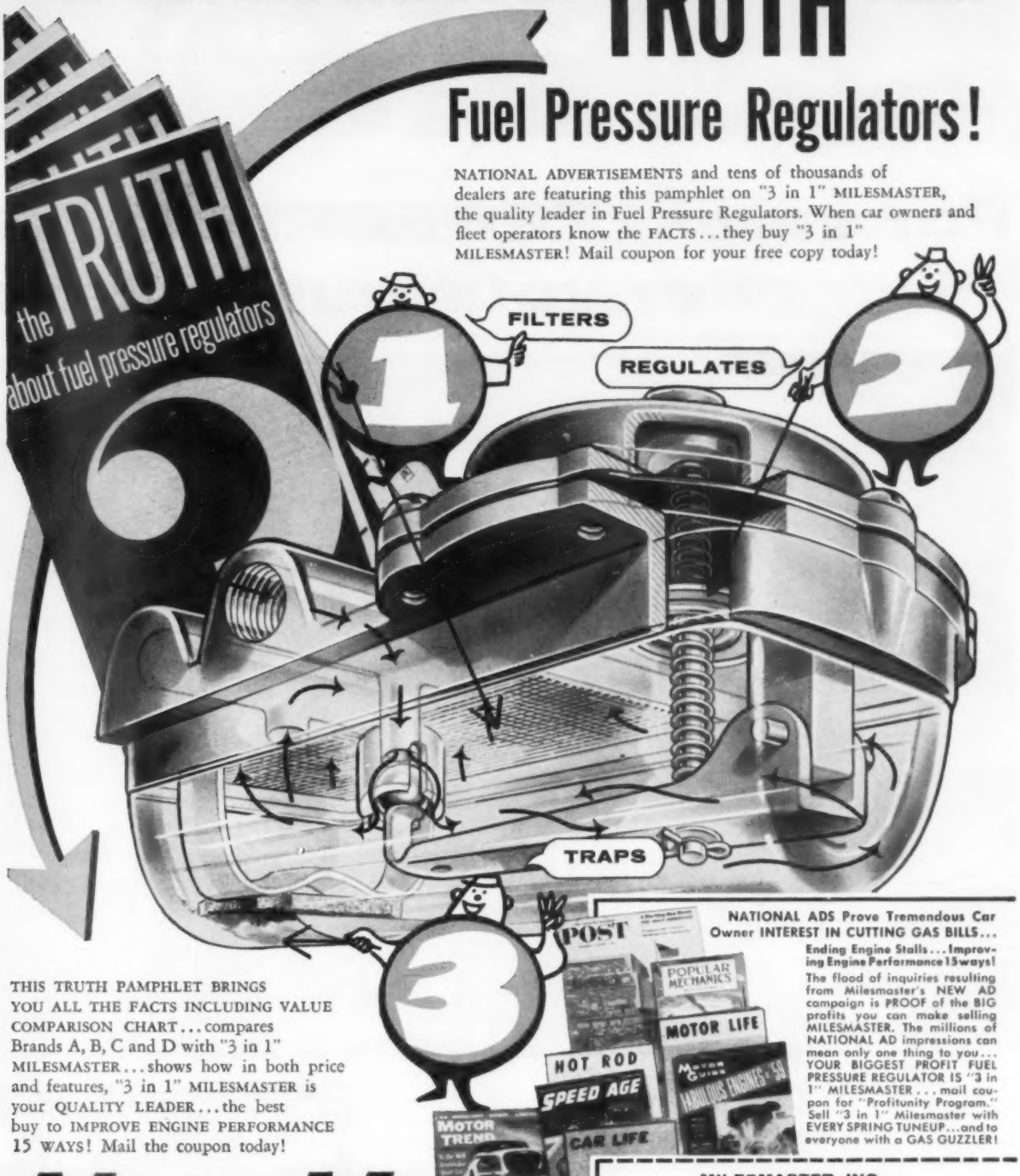
Under black light, the developed penetrant outlines fatigue, grinding, heat treating or casting cracks, forging laps, porosity areas or other imperfections, in brilliant color.



Right — cracks in an aluminum truck wheel glow under black light. Below —penetrant reveals serious fatigue cracks in automotive gear.

Thousands have Learned the TRUTH about Fuel Pressure Regulators!

NATIONAL ADVERTISEMENTS and tens of thousands of dealers are featuring this pamphlet on "3 in 1" MILESMASTER, the quality leader in Fuel Pressure Regulators. When car owners and fleet operators know the FACTS... they buy "3 in 1" MILESMASTER! Mail coupon for your free copy today!



THIS TRUTH PAMPHLET BRINGS YOU ALL THE FACTS INCLUDING VALUE COMPARISON CHART... compares Brands A, B, C and D with "3 in 1" MILESMASTER... shows how in both price and features, "3 in 1" MILESMASTER is your QUALITY LEADER... the best buy to IMPROVE ENGINE PERFORMANCE 15 WAYS! Mail the coupon today!

NATIONAL ADS Prove Tremendous Car Owner INTEREST IN CUTTING GAS BILLS...

Ending Engine Stalls... Improving Engine Performance 15 ways!

The flood of inquiries resulting from Milesmaster's NEW AD campaign is PROOF of the BIG profits you can make selling MILESMASTER. The millions of NATIONAL AD impressions can mean only one thing to you... YOUR BIGGEST PROFIT FUEL PRESSURE REGULATOR IS "3 in 1" MILESMASTER... mail coupon for "Profitunity Program." Sell "3 in 1" Milesmaster with EVERY SPRING TUNEUP... and to everyone with a GAS GUZZLER!

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Rush free pamphlet: "Truth about Fuel Pressure Regulators" and DEALER PROFITUNITY PROGRAM. No obligation, of course.

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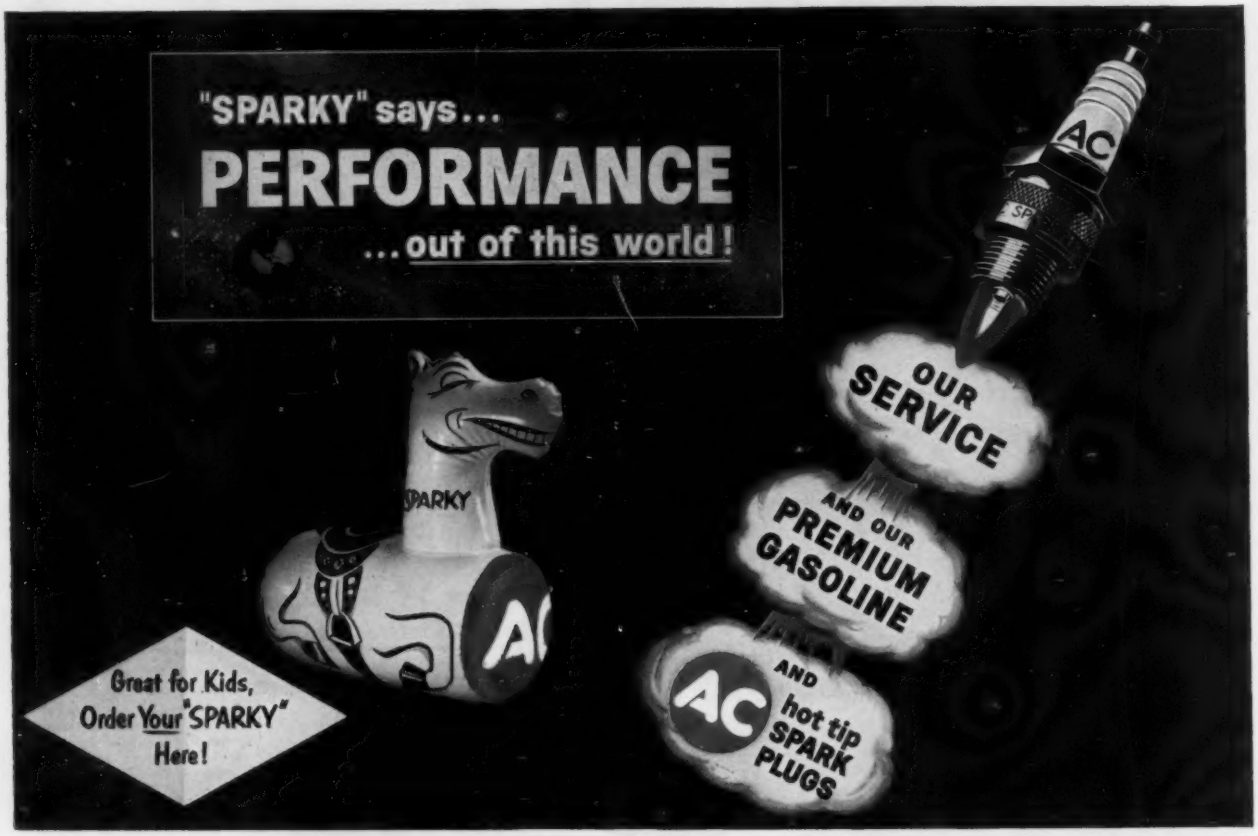
AC SELLING SLANTS

MONEY-MAKING FACTS

For sales "PERFORMANCE" offer your customers



SPECIAL PROMOTION ADVERTISING will announce the "Sparky" offer to your customers in *Life* magazine, along with a special AC commercial promoting the vinyl inflatables offer on AC's popular television program, "Zorro".

And, in April and May, AC will support your sales efforts and "Performance Out of This World" campaign with . . . full-color, full-page ads in *Life*, *The Saturday Evening Post* and other nationally circulated publications . . . AC Spark Plug commercials on the ABC-TV adventure series, "Zorro" . . . and outdoor advertising on billboards in every large community.

OF THE MONTH !

FOR DEALERS

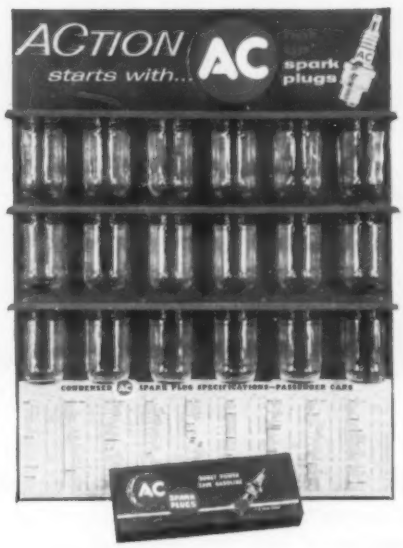
OUT OF THIS WORLD"
"SPARKY" INFLATABLES!

A NEW KIND OF TRAFFIC BUILDER will help you spark AC sales this spring, during AC's "Performance Out of This World" spark plug campaign. An outstanding, traffic-building display for your station window includes a giant "Sparky" float toy and colorful window trim featuring the spring campaign theme . . . and a unique, customer offer.

During the campaign, you can offer your customers "Sparky" vinyl inflatables, like the one in your AC Spark Plug Window Display . . . a traffic builder if you've ever seen one!

You can buy a quantity of the vinyl inflatables at a special, low price and use them with "service specials" . . . such as the sale of a new set of AC Hot Tip Spark Plugs. And, you can provide AC order forms which will allow your customers to purchase the giant "Sparky" float toys at about half the normal retail price.

STORE SMALL PARTS IN THE AC STORAGE RACK! AC's new, small-parts storage board is the handiest, time-savingest parts holder ever. It's a sturdy, 18" x 24" all-metal board to which 18 small glass jars are attached. Just hang the colorful rack in a convenient location. Then store nuts, bolts and other small items in the handy *removable* jars. The parts are plainly visible and easy to get to. To help speed spark plug installation, the bottom of the storage rack includes an up-to-date AC Spark Plug Specifications Chart.



YOU CAN HAVE ALL THREE . . . Unique AC Spark Plug Display and "Sparky" inflatable . . . The new AC rack . . . and, a set of 8 AC Spark Plugs worth $8.24 is the AC SPM-48 SP promotion package. To obtain the package here is all you do:

Include $8.24 with your order for any 48 AC Spark Plugs and you will receive SPM-48 Promotion Package.

When you have sold the set of AC Spark Plugs you have recovered $8.24. The profit from the sale of the spark plugs pays for the promotion package!

AC SPARK PLUG ⚛ THE ELECTRONICS DIVISION OF GENERAL MOTORS

CALL YOUR REGULAR AC SUPPLIER TODAY!

AC SELLING *SLANTS*

MONEY-MAKING FACTS

BALLOON YOUR AC WITH "TRAPPER"

SPECIAL PROMOTION ADVERTISING will announce your "Trapper" offer in *Life* magazine, along with a special AC commercial featuring the vinyl inflatables offer on AC's popular television show, "Zorro".

And, during April and May, AC will support your sales efforts and "Get A Clean Start" campaign with . . . full-color, full-page ad in *The Saturday Evening Post* . . . AC Oil Filter commercials on the ABC-TV adventure series, "Zorro"... and outdoor advertising on billboards in every large community.

OF THE MONTH !

FOR DEALERS

OIL FILTER SALES VINYL INFLATABLES!

A UNIQUE DISPLAY AND CUSTOMER OFFER will help you increase AC Oil Filter sales during AC's "Get A Clean Start" oil filter campaign this spring. The display includes a giant "Trapper" inflatable float toy and attractive window trim featuring the spring campaign theme . . . and an unusual customer offer.

During the campaign, you can offer your customers "Trapper" inflatables like the one in your AC Oil Filter Window Display . . . just the thing to build traffic *and sales* this spring!

You can buy a quantity of the vinyl inflatables at a special, low price and sell or give them away with "service specials" . . . such as a change of oil and AC Oil Filter. Or, you can provide AC order forms which allow your customers to purchase the giant "Trapper" float toys at about half the normal retail price.

NEW 16-PIECE "BALLERINA" DINNERWARE SET, created by Universal Potteries, will decorate your table and please your wife. This fresh, new dinnerware set is designed in the handsome Harvest Wheat Pattern, with a 22-carat gold edge and a cluster of wheat on each piece in the set. Sturdy, good-looking and oven-proof, each piece of this high quality dinnerware is guaranteed against glaze cracking due to heat or cold. In the service for four, the set includes four luncheon plates, four dessert dishes, four cups and four saucers. Additional pieces of this serviceable dinnerware are available in open stock at leading department stores.

GET THESE THREE in the AC Oil Filter Promotion Package for spring . . . The unique AC Oil Filter Display and "Trapper" vinyl inflatable . . . 16-piece set of high quality dinnerware . . . and, three AC Oil Filter Elements worth $7.60! To obtain this package here's all you do . . .

Include $7.60 with your order for any 24 AC Oil Filters and the OFM-49 Promotional Package! When you have sold the three extra AC Oil Filter Elements you have recovered $7.60. The profit from the sale of the extra elements pays for the promotion package!

AC

CALL YOUR REGULAR AC SUPPLIER TODAY!

AC SPARK PLUG ✿ THE ELECTRONICS DIVISION OF GENERAL MOTORS

AC SELLING *SLANTS*

MONEY-MAKING FACTS

Open her eyes . . .

with this multi-colored Sheet and Pillow Case set!

TRADE MARK CANNON

Get it for her with this AC Fuel Pump Promotion

Here's your chance to give your little lady a pleasant surprise and build your Spring fuel pump sales at the same time. Join the big Spring AC Fuel Pump Promotion and bring home this truly beautiful, truly different sheet and pillow case set, designed by famous Cannon Mills. The set includes one double-bed (size 81″ x 108″) sheet and two large pillow cases (42″ x 36″), all in multi-colored stripes and gift-wrapped to really open her eyes. The material is Cannon Combspun Percale, highest quality in the sheeting industry. She'll love it . . . and she'll love you, too . . . for your thoughtfulness.

All you do is . . .

Include $8.70 with your order for *any* 6 AC Fuel Pumps and you'll receive the FPM-50 Package which includes: the Cannon Combspun percale sheet set and the popular #4460 AC Fuel Pump for Chevrolets. When you sell the pump, you recover your $8.70 investment. The profit on the sale of the extra pump pays for the promotion package.

Pump up your Profits with AC Fuel Pumps!

OF THE MONTH !

FOR DEALERS

New Model AC Tester Adjusts to All Air Cleaner Sizes!

Now, with new cars coming out with many different sizes of air cleaners, AC has solved the problem of testing all sizes with just one tester.

This new model AC air cleaner tester can be quickly and easily adjusted to fit any size dry-type cleaner—from small to very large circumference.

New Air Control Valve Does It!

The new air control valve (shown left) permits the adjustment. New easy-to-follow instructions are printed right on the tester.

Once adjusted, the new model works just like previous models. It shows you instantly whether an air cleaner is functioning properly, whether it is partially clogged and needs cleaning or whether it is completely clogged and should be replaced.

It's an excellent demonstration for customers—helps make air cleaner sales on the spot.

Your Present Model "M" Brought Up To Date **Without Charge!**

As you may know, the present Model "M" AC air cleaner was introduced in 1957, when there was a limited number of types and sizes of air cleaners in operation.

If you purchased one of these models, AC now makes it possible for you to bring this tester up to date . . . *without charge.*

AC has developed a special conversion kit that includes the new air control valve, a new tube and new instructions for operating. With this kit, your present tester can quickly be converted, so you can test any size cleaner. In fact, it becomes a new model tester.

Your AC representative will contact you soon . . . and make this conversion. Again . . . *no charge for the service.*

Get your new tester now from your regular AC supplier and get more air cleaner business by selling **AC DUST-TITE AIR CLEANERS!**

AC SPARK PLUG ❀ THE ELECTRONICS DIVISION OF GENERAL MOTORS

By HERB CARRIER
Detroit Editor

Fuel control systems

Converting liquid gasoline into mechanical energy involves more than carburetion. Air filters, manifolding and exhaust systems—all play an equally important role in providing efficient, economical engine operation from tank to tailpipe under constantly changing conditions.

Part V—Manifolds And Air Cleaners

● THE IMPORTANCE of unrestricted air flow to, through, and from the engine cannot be over emphasized. Without air the engine would not run, and without *clean* air the engine would not run satisfactorily for long. Few things are more harmful to an internal combustion engine than abrasive laden air induced into the combustion chambers. Consequently, practically every internal combustion engine in use today is equipped with some form of air cleaner; be it dry-type, wet-type, or just plain oil-dampened wire mesh. Efficient air cleaners take care of the incoming air, but once the air is mixed with gasoline to form a combustible vapor, cleanliness and volume are overshadowed by a greater problem—distribution.

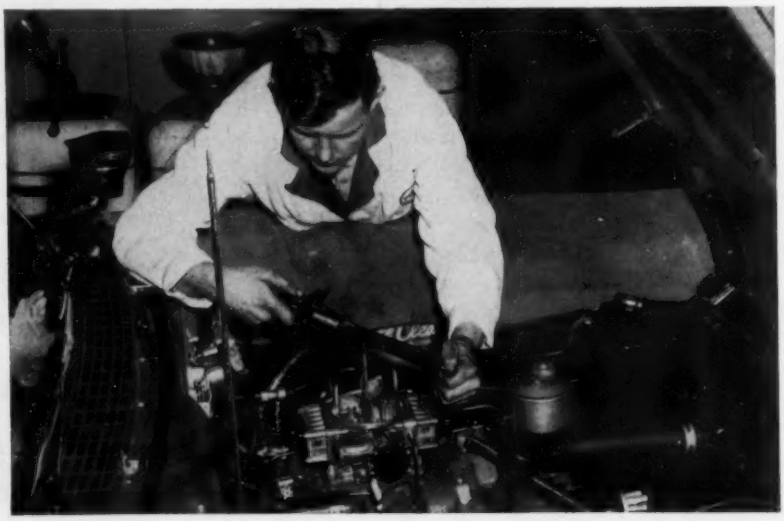
INTAKE MANIFOLDS

In the early days of automotive engineering, the problem of equal fuel distribution to all cylinders of a six or eight cylinder engine was not easy to whip. The root of the problem was the distance between the cylinders and the carburetor. Cylinders nearest the carburetor would tend to get an over-rich mixture of fuel and air. Those farthest from the carburetor got mostly air with very little of the fuel left in suspension. This was due to the fact that the speed of the incoming air was not sufficient to prevent the gasoline from condensing back into a liquid.

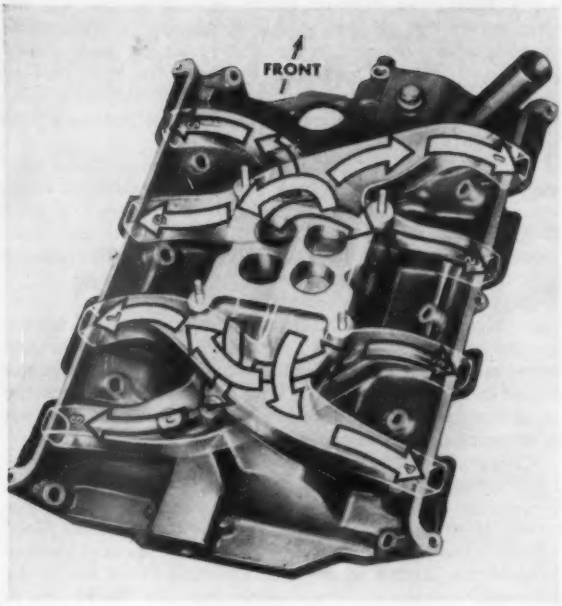
It was soon found out that the diameter of the intake manifold passages played an important part in controlling the speed of the fuel-air mixture. Originally it seemed that a large diameter intake would make sure that the engine could draw in a full charge of vapor. Later this was proved not true. Today's intake manifolds have considerably smaller I.D.'s than those a number of years ago. Smaller intakes stepped up the rate of flow.

Think of it this way: If a child tried to sip a soda through a straw the size of a garden hose, he'd really have to work to get any liquid flow. But if he reduced the straw size to normal, the life-giving nectar would flow easily and at a good rate of speed. This principle applies to the relationship of intake manifold size to fuel-air distribution.

Some gasolines, especially those with low gravity, are difficult to vaporize, or "break up." If they do vaporize when passing through the carburetor venturi, they tend to condense easily and cling to the walls of the intake manifold. Reducing the inside diameter of the manifold increases the rate of flow and, therefore, reduces the



Torquing intake manifolds must be done to manufacturer's specs. Unequal torque can lead to warpage and leakage—or in case of severe overstress, to eventual cracking of the manifold.



Modern carburetion involves complex arrangements of fuel flow in conjunction with manifolding, as illustrated schematically here, to counteract inherent tendencies of the air-fuel mix.

tendency of the fuel to condense and cling.

A large diameter intake manifold used with low gravity fuel, is "a cinch" to cause engine lope when the throttle is closed after a long hard pull. Heated intake manifolds tend to reduce the condensing and clinging problems, but to this day the problems are not completely solved.

TURBULENCE HELPS

One point of difference among engineers is the question of *easy bends* versus *sharp bends*. One school of thought says a clean sweep with no sharp angles offers less resistance to air flow, and therefore, is the best design for intake manifolds. The other viewpoint is that the sharp bend is best because it causes violent turbulence (whirling) of air at the spot where gasoline vapor is most likely to condense and cling to the manifold wall.

The *sharp turn* school says that an easy bend manifold holds only the lighter ends of the gasoline in suspension in the center of the air stream. The heavier particles are free to collect in pools along the outer sides of the manifold. The pooling up of fuel droplets is most evident where the manifold negotiates a smooth, easy bend. The same condensing and depositing problem exists with a sharply bent manifold, but the turbulence created at the bend serves to break up the deposited fuel and carry it along to the other cylinders in a fairly even fuel-air mixture.

Some engineers go so far as to suggest that the use of a square section manifold, rather than a round section as currently used, would offer still better distribution by offering greater turbulence.

HEATING ALSO HELPS

Heating the intake manifold will also help to prevent the gasoline vapor from condensing back into liquid gasoline. Practically all automotive engines have some means of heating the intake manifold. Usually the hot exhaust gases are used for heating purposes. Recently, water passages have been cast into the intake manifold to allow engine coolant to circulate through the manifold and to help maintain even temperatures.

This system works very well. There is a danger, however, in heating intake manifolds. Too much heat will expand the vapor enough to give it low density. The result is that less weight of gasoline can be drawn into the cylinder per intake stroke. Less gasoline means less power. Therefore, manifold heat should be carefully controlled; and it is.

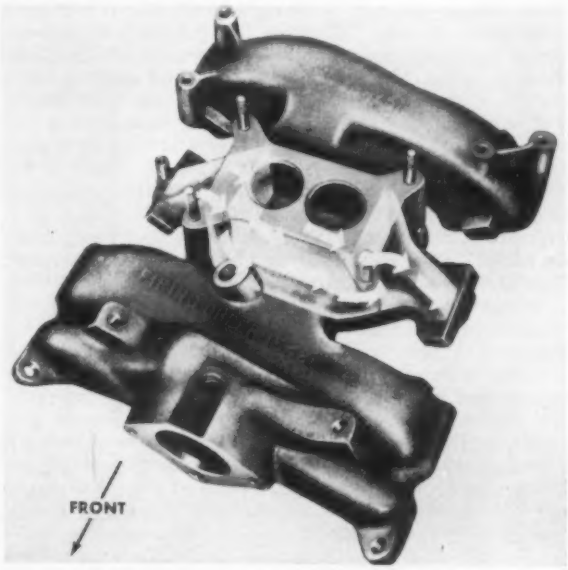
On the other end of the problem, too little manifold heat, or too slow an incoming air speed, will also result in less gasoline reaching the cylinders, because the fuel will not be properly vaporized. Modern manifolds are precisely designed to deliver maximum efficiency. It is seldom wise to alter or remove manifold components. Unbalanced manifolding will seriously hamper engine operation.

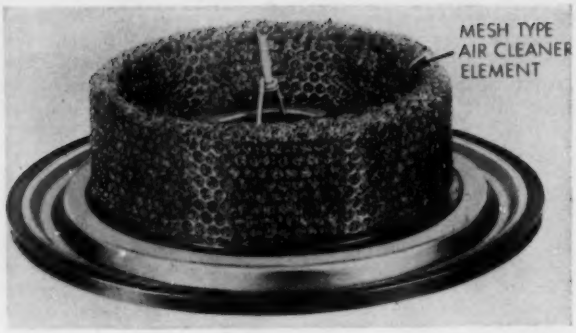
DUAL MANIFOLDING

The greatest share of American-built cars are now using dual down-draft carburetors and dual intake manifolds. This set-up gives the same results as would be obtained from two separate four-cylinder manifolds and carburetors. On a V-8 engine, it's common to have one barrel of the carburetor feed the two inside cylinders on one bank of the engine and the two outside cylinders on the other bank. In this way, the fuel distribution is well balanced and the engine's performance is considerably greater than it would be if each carburetor barrel fed the four cylinders located on its side of the engine.

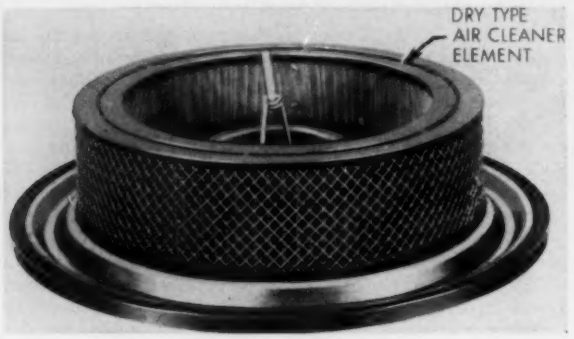
In dual manifolding, many methods of fuel distribution are possible. In almost every case, each manifold of a dual manifold set-up operates independently of the other. There is, however, a common passage-way between the two manifold cores, near the vacuum connections for the distributor vacuum advance and the vacuum connection for the windshield wiper. It's important that the distributor and windshield wiper vacuum connections operate off the passage-way between the two manifolds, as this is the only spot in the intake system that has full eight cylinder vacuum. If wiper motor and distributor advance mechanism operated only on one side of the dual manifold, the vacuum delivered would be the characteristically pulsating vacuum of a four cylinder engine.

Heating intake manifolds has been developed to a fine point in today's cars. Directing exhaust gases (arrows) through the manifold is one of the keys to efficient fuel flow.





Mesh type cleaner (top) is simply oil-moistened wire element. Dry type uses pleated paper to remove micron-size impurities.



At the common point—sometimes the base of the carburetor—the vacuum operated accessories and components get the steady, even vacuum of an eight-cylinder engine. This same principle is involved when the dual manifold is used on a six cylinder engine. In this case, of course, the vacuum benefits off the common point would be for six cylinders rather than three.

SERVICE POINTERS

Intake manifolds have no moving parts, ordinarily. Therefore, very little actual service work is necessary to keep them in working condition. About the most serious thing that can happen to an intake manifold is improper installation torque. Torquing the manifold to uneven specs, or in the wrong tightening sequence, can cause the manifold to warp. A warped manifold stands a good chance of cracking. If it doesn't crack, it most surely will leak. A badly cracked manifold is easy to spot and requires replacement; a warped manifold can cause poor engine operation long before it is detected. Leaks in the intake manifold are bad because they permit the cylinders to draw raw air from the atmosphere without mixing it with gas. Consequently, the engine develops low power. An added danger from the lean mixture is burned valves. Burned valves and lean mixture run hand in hand.

Always torque intake manifolds according to the manufacturer's specifications, and in the recommended sequence. Proper torquing is the only way to prevent manifold warpage and cracking. A warped manifold can be salvaged by accurate machining. A cracked manifold requires replacement. Either procedure is costly and usually avoidable by proper installation.

Manifold leaks can be detected by running the engine at idle, and squirting light lubricating oil along the manifold gasket. Bubbles indicate a leak. A vacuum gauge connected to the engine while the leak detecting procedure is being carried out can assist in locating the leaks. Using the vacuum gauge technique, run the engine, squirt the oil and watch the gauge. If the needle shows higher vacuum when the gasket is temporarily sealed with oil, the gasket is obviously leaking. Sometimes torquing-down the manifold will stop the leak. More often, the old gasket will have to be replaced with a new one.

Some mechanics like to live dangerously. These wild ones can be found checking for intake manifold leaks with gasoline! It works, of course, but there's a good chance of starting a man-sized fire. Oil is the only recommended manifold leak detecting agent. The use of gasoline, kerosene, or alcohol should be avoided.

Excessive carbon deposits are the plague of manifolds. Even the most efficiently designed manifold cannot operate efficiently if it is "all coked up." On some late model engines, it's not unusual to find the intake passages almost blocked by carbon. This is especially true if the car is operated at slow speeds in heavy city traffic without an occasional exercising.

Chemical cleaner-outers are available which will effectively remove carbon, gum, and sludge *if* it isn't too bad. A severely "coked-up" intake manifold should be removed from the engine and thoroughly cleaned. Good periodic maintenance is to run a can of chemical cleaner through the engine at regular intervals. This keeps the induction passages clean, preventing the build up of power-robbing deposits.

AIR CLEANERS

For every pound of fuel burned in the normal operation of an automotive engine, approximately 12 to 17 pounds of air are consumed. This air must be clean if the engine is expected to deliver acceptable performance throughout an average life span. Introducing dirty air into the engine is a sure way of ruining the carefully engineered close tolerances found in today's precision automobile power plants.

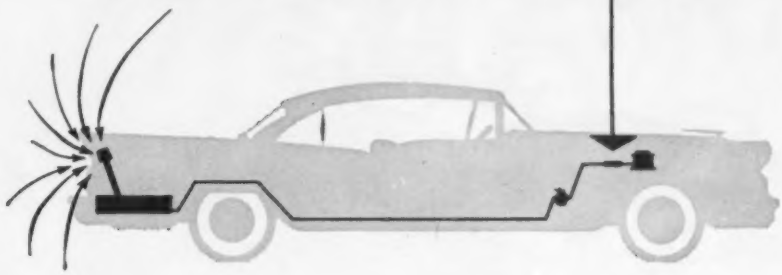
At one time, air cleaners were simply built; and used a wire mesh—dampened by oil—as the sole filtering element. All air entering the engine passed through the

Air cleaner housings differ according to type of cleaner and type of installation. Note the slight differences in external appearance in the representative examples shown below.

ALREADY BREAKING SALES RECORDS

CARTER

IN-THE-LINE GASOLINE FILTER



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50 FIFTY YEARS OF ENGINEERING THE FUTURE

CARTER CARBURETOR

DIVISION OF acf INDUSTRIES, INCORPORATED
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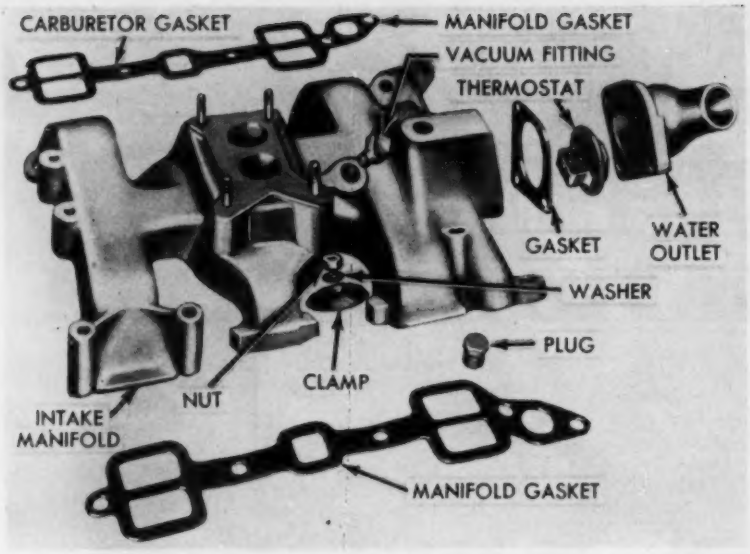

Details of the intake manifold. Although it has no moving parts and needs little servicing, it can be a source of serious trouble if improperly installed.

wire mesh. Foreign particles suspended in the air were trapped in the mesh. After becoming loaded with filtered-out material, the cleaner was removed and the wire mesh washed, dried, and re-oiled.

The mesh-type air filter lasted indefinitely. There was nothing to wear out. Its big fault was the inability of the mesh to remove all the harmful particles from the air. Consequently, the mesh-type had to go in favor of an improved design.

After the mesh-type cleaner came the oil bath air cleaner. This type used an entirely different operating principle to remove air-borne impurities. Instead of the wire mesh alone, a reservior of engine oil was used. Through clever design, air entering the carburetor was first forced to change directions rapidly. For example, air would travel horizontally to enter the air cleaner; then it made a sharp turn and traveled downward. After a short trip in this direction, the air made an abrupt turn and headed upward, then downward again into the engine. The sharp turn from downward to upward—negotiated when the air was traveling at a considerable velocity—caused foreign matter in the air to continue going downward where it was trapped by the reservoir of oil. The oil eventually became heavily contaminated, and was removed and replaced with clean oil of the same weight and grade as that used in the engine at that particular time.

OIL BATH DISADVANTAGES

The oil bath air cleaner was an improvement over the wire-mesh air cleaner because it was capable of removing more and smaller impurities from the incoming air. Oil baths do have disadvantages, however. For one thing, the efficiency of an oil bath air cleaner is keyed directly to engine RPM. If the engine is running at fairly high speeds, the velocity of the incoming air is great enough to cause the foreign particles to drop out into the oil. But at slower engine speeds, incoming air velocity is not sufficient to snap the impurities out of the airstream. At slow speeds, then, this type of air cleaner tends to allow contaminated air to enter the engine.

Another undesirable feature of the oil bath air cleaner is the possibility of oil "carry over." Under certain conditions, such as too high oil level in the reservoir or high-speed cornering, it's possible for the incoming air to pick up droplets of dirty oil and carry them into the engine. Correct operation of the air cleaner calls for a certain amount of oil pick up so that an inner wire mesh will be kept moist at all times. Oil pick-up of just a little more than normal can result in unwanted transfer of dirty oil from the reservoir to the engine combustion chambers.

THE DRYS ARE IN

The latest in air cleaners is the dry type. It has been used for a number of years, and has worked out very well. In the dry-type cleaner, no oil or mesh are used. The entire filtering element consists only of pleated paper. All air entering the engine via the carburetor is passed through the paper filter. A dry-type air cleaner is extremely efficient. It can remove particles from the air that are so small they have to be measured in microns. It's much more efficient than either the wire-mesh air cleaner or the oil bath air cleaner.

As in all things, there are also some drawbacks to the dry-type. Perhaps the most serious handicap is its own efficiency. In dusty conditions, a dry-type air cleaner can capture so much dirt that the paper element becomes completely blocked up. When this happens, the engine starves for air and operates badly or not at all.

The remedy is simple. Merely remove the paper element, tap it lightly against a hard surface, and replace it in the filter body. A filter element is serviceable until the paper becomes torn, after which it must be replaced. Installing a cleaned or a new paper element can lead to trouble if the retaining nut is tightened down too far. Too much pressure on the nut causes the filter seal to rupture. A broken seal allows air to enter the carburetor and engine without passing through the pleated paper.

It's almost impossible to detect a damaged seal without removing the element. An improperly installed element can be admitting harmful impurities to the engine for many thousands of miles before it is discovered. The answer to the problem is not to snug down the retaining nut too firmly. It only needs to be snugged up enough to seal the filter on top and bottom, and to prevent the element from shifting.

A reasonable amount of intelligent service will satisfy the air induction system of an internal combustion engine. Considering the amount of air it handles during the life span of an average vehicle, the induction system is among the most trouble-free of all engine areas.

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Ben Ikert, Editor

Water in Automatic Choke

Can you tell me why water accumulates in the automatic choke of a two-barrel carburetor used on a 1956 Ford; and if there is any cure other than installing a new choke? *C.J.F., Bayard, N.M.*

Answer: The reason water gets into the automatic choke is that the heat riser tube that carries hot air to the automatic choke is burned out. This permits exhaust gases to get up into the choke (through the burned out tube) and the water vapor in the exhaust condenses. You will remember that exhaust is 50% water vapor from the combustion of the hydrogen in the fuel.

The remedy is to remove the intake manifold, take out the old-burned-out tube and replace it. In this connection, there is an easy-to-install choke-stove kit on the market using an external heater tube which won't burn out.

Freezing Batteries

Our local newspaper recently ran an article on putting up boats for the winter months, and made mention of storing the batteries in deep freezers. In this connection it was mentioned that the recent South Pole Expeditions had proven that the best way to keep a battery in storage was to freeze it.

Well now, it has always been my experience that when a battery is frozen it is finished, and any effort to recharge it causes the active material to fall out.

Answer: The article you refer to is half right, but somewhat misleading. Keeping batteries cold is the best way to keep them from sulphating and self-discharging, *provided that they are not allowed to freeze.*

You are quite correct in saying that a battery which freezes will be ruined; but remember, there is a big difference between keeping batteries cold and freezing them.

Cold batteries become sluggish, so that the chemical reactions of becoming sulphated and self-discharging are slowed down materially.

The freezing temperatures for a battery are as follows:

Gravity	Temperature
1.280	-90°F.
1.250	-62°F.
1.200	-16°F.
1.150	+5°F.
1.100	+19°F.

So, from the above you can see that batteries with a gravity of 1.250 or more are in no great danger of freezing.

Generator Tell-Tale Light

A 1957 Ford in our shop has a Leece-Neville generator and regulator on it that is used with the cell system or rectifier. The "tell-tale" light on the dash has been removed, and we are having trouble hooking it up again. Any suggestions will be appreciated.—*C.M.J., Belgrade, Nebr.*

Answer: The "tell-tale" light is connected to the side of the ignition switch away from the battery and to a terminal in the generator circuit that has output voltage with generator running, but will provide a ground when generator is not running. This results in having the indicator light ON when generator is not putting out current and OFF when it is, because both ends of the light circuit at this time are approximately the same voltage.

When the generator is not putting out current and the ignition is turned on, battery current flows to the light and through the inoperative generator as a ground. The same principal will apply with the Leece-Neville system. The diagram we have at hand does not indicate where the tell-tale is connected, but by connecting one end of the circuit to the ignition switch you can make some tests with the generator running and not running to find out where to connect the other end.

WHEN CHANGING YOUR ADDRESS

Please notify us 5 weeks in advance. Supply us with both your old and new address, including address label from current issue if possible. Copies we mail to your old address will not be delivered by the Post Office unless you pay them extra postage. **Mail address changes to Circulation Dept., Automotive Service Digest, 900 South Wabash Ave., Chicago 5, Ill.**

Hard Starting Hudson

A customer's 1955, 6-cylinder Hudson Hornet runs as good as you could ask of any car, but there is one bugaboo: When cold the engine turns over very easily, but when it gets hot it will hardly turn over fast enough to start.

The ignition system has been thoroughly checked, and is in good shape; compression is also satisfactory.

Before going any further with this one, I would appreciate any information or suggestions you can give me. *C.L.F., Mebane, N.C.*

Answer: Some simple tests should tell you where the trouble lies. First, measure the ampere draw cold, which should not be over 300 amperes. Then measure it hot, which should not be over 175-200. If amperage draw is more hot than cold, you better check the starting motor. Check the voltage drop in the starting circuit both hot and cold, on both hot side and ground side. Check the voltage drop across the starting motor switch (the one that carries the full starting current, not the relay). Be sure the battery is fully charged, and that voltage drop is not more than 1-5 volts when operating starter motor for 15 seconds. Also make certain that the starting motor commutator is clean and that brushes are not excessively worn.

Generator Voltage

What is the easiest way to determine whether an unmarked generator is a 6-, 12- or 24-volt unit?—*G.C.P., Beulah, N.D.*

Answer: An easy way is to use a 12-volt battery and a low-reading ammeter in series with one side. Touch

the leads (one from battery and one from ammeter) to the A and F terminals on the generator, which will measure field current flow.

If current flow is from 1.5 to 3 amperes, the generator is a 12-volt unit; if current flow is from 3 to 6 amperes, the generator is a 6-volt unit; if current flow is from approximately .7 to 1.5 amperes, the generator is a 24-volt unit.

There is not enough difference in the field current draws to tell from the specifications, but if 12-volts is applied to a 6-volt field coil, according to Ohm's Law the current flow will be double what it would be with a 6-volt battery. This will pick out the 6-volt generators in a hurry. With 12-volt field coils, there will be the normal 1.5 to 3 ampere flow.

On Ford-built generators, which use the so-called B or heavy-duty circuit, the field is grounded in the generator, or in some cases by an extra G terminal on the generator. If there are two field terminals, connect to them to get the field current draw; otherwise, connect to the F generator terminal and to the generator frame or ground.

If you get a very low reading when connecting across the A and F terminals on a strange generator, it will probably be a Ford type. Then try either the two field terminals or the F terminal and to the generator frame. If there is no reading, the field may be open, in which case the generator should be carefully checked as to all its circuits.

Conflicting Temperatures Stamped on Thermostats

According to a recent DeSoto Service Bulletin, a quantity of 180° thermostats, which are incorrectly stamped 160° on the gasket flange surface, were used in some 1959 DeSoto engines. The correct 180° figure is stamped on the bottom of the pellet. However, the presence of the conflicting numbers may cause some confusion. This applies only to the double coil spring type Fulton-Sylphon type thermostat.

All 1959 DeSoto cars are shipped with 180° thermostat as standard equipment. If it should be necessary to determine the heat range of a thermostat in a '59 DeSoto engine, always refer to the number stamped on the pellet at the bottom of the thermostat assembly.

To make your shop more profitable . . . your time more valuable . . . be sure to read this month's "These Are New" section

Chevrolet Changes Timing On 235 cu.in. Engines

Ignition timing on all 1959 Chevrolet passenger and truck six cylinder 235 cu.in. engines is now being set in production at 5° BTDC. The 5° BTDC mark is the first short vertical line stamped on the flywheel at a location clockwise from the timing ball representing TDC.

The change in ignition timing from TDC to 5° BTDC was made to improve engine performance and economy. It is suggested that early 1959 production engines, with timing set at TDC, be reset to 5° BTDC at time of an engine tune-up. Ignition timing on past model 235 cu.in. engines and all 261 cu.in. engines remains at TDC.

Plug Gaps Standardized On British Engines

Most English tune-up specifications have traditionally called for gap spacings of .022". Extensive tests recently completed, however, show that .025" gaps give better over-all performance. While some cars using so-called high voltage coils will still require .030" settings, these new standards fit U.S. and Canadian gap gauges and will further simplify plug installations.

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When they supply demand
for remarkable, fast-moving
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Prospects are PRE-SOLD on brilliant, new car PERFORMANCE

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Close tolerance and precision fit in every operation are verified by micrometer readings and thickness gauge check-outs.

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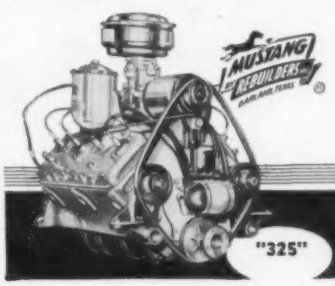
a distinguishing virtue of Mustang Replacement Engines . . . is a quality with enormous appeal to your car and truck owner customers. Power-packed, precision-built MUSTANG is truly a dynamic, pace-setting engine assuring 10% more power, longer life, lower operating and maintenance costs and customer satisfaction beyond expectation.

Mustang dealerships are richly rewarding for every type of automotive service shop. Money-making advantages include complete lines, one day installations, $10.00 per shop hour profit, liberal trade-in allowances and extra profits selling related parts.

Powerful POST advertising, service clinics and merchandising aids are skillfully coordinated to help your shop hit the jack-pot with MUSTANG. See your jobber for this fabulous profit story.



"325"

MUSTANG ENGINES
International Road, Garland, Texas

Customers may come in all types, sizes and incomes . . . but there are a couple of things they all have in common—Every motorist wants his car to have only perfection in servicing, regardless of how he handles it himself; and knows when it's been "wronged." All car owners are sensitive to . . .

Common shortcomings in craftsmanship

• ALTHOUGH NOT EXPERTS on automotive parts and systems, today's motorists are able to detect—and quick to condemn—the shortcomings of service work done on their cars. They do know that the modern automobile is a complex machine, subject like any other machine to wear and deterioration, and sensitive to abuse. Yet the owner who mistreats the vehicle himself, expects it to receive nothing but the gentlest and most skillful treatment from the service man.

When he has trouble, takes the car to the shop, and finds he still has trouble after paying the bill and getting his car back, the motorist takes action in no uncertain manner. Even if the shop "makes good" on the unsatisfactory job, this customer is practically certain to take his business elsewhere the next time around. He will continue, as a rule, to change from shop to shop, until he finds one whose work satisfies him.

What this customer is trying to find is the thing practically all motorists consider the most important part of service and repair work: craftsmanship. And what keeps far too many of them searching is shortcomings in automotive craftsmanship that are much more common among shops than they should be.

THE "PROFESSIONAL TOUCH"

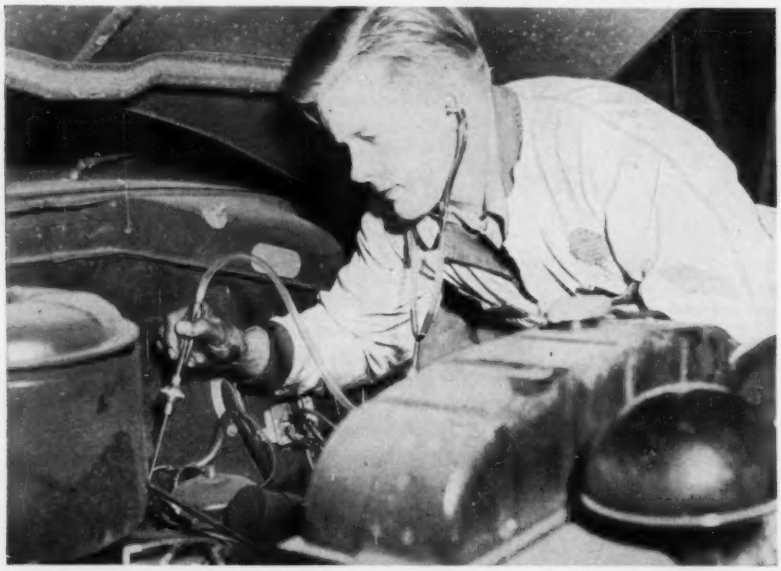
Poorly trained mechanics, whether interested beginners or men who've "just picked up" mechanical knowledge over the years, are one common shortcoming. No matter how good his intentions, an untrained shop man is "dangerous" to business and to good workmanship. The damage he can do—unintentionally—to intricate and highly-engineered parts and systems, makes a trained specialist's blood run cold at the thought. In the hands of the man without "technical know-how," a pair of pliers and a screwdriver are deadly weapons against automotive craftsmanship.

Even if all the errors made by a man who lacks the necessary "know-how" are caught and corrected before the job goes out—which is unlikely—the work will already have taken much too long. The labor charge will be unjustifiably high, and probably "tinkering" will have added an unnecessary part or two to the bill.

It's a situation where the shop "can't win for losing." Either the customer goes elsewhere because he's unhappy with the price or the results, or the shop itself takes a beating on its fair margin of profit—something it can't do for long.

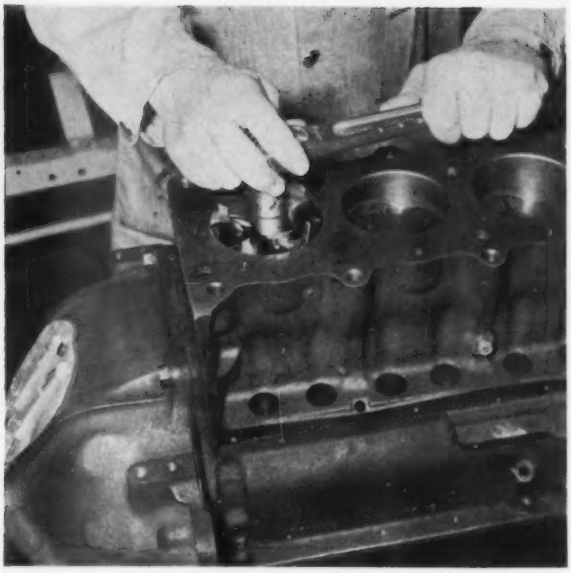
One of the "musts" of automotive craftsmanship is properly-trained, highly skilled mechanics. This does not rule out "bringing in new blood" to the shop—which the service field needs in a "big way." It does mean that the unskilled man must be properly trained "from the ground up."

Service business being what it is today, there are good



This scientific approach to the diagnosis of trouble is not as common a sight as it should be. Here, the service man is applying the "soundscope" to pinpoint the source of a noise indicating something amiss.

By GUY F. WETZEL
Technical Editor



When an automotive craftsman does cylinder and piston work, he doesn't miss a bet in care and thoroughness. For example, here's how he goes about removing the ring ridge "exactly right."

reasons why this training cannot be left to the experienced "pros" in the shop. First of all, the top craftsmen are "loaded" with customer jobs—secondly, teaching too is best left to its own "pros." The ability to do the work does not automatically give one equal ability to teach. Once a beginner has acquired basic knowledge, he can learn "volumes" from the advanced tradesman—and very fast—by watching the other work and asking intelligent questions. But up to that point, the novice will learn quicker and better from the specialist in technical instruction.

NO LACK OF FACILITIES

Fortunately, there's no lack of suitable courses that can be taken, either full-time or part-time while the beginner is working in the shop, doing minor jobs. He can become familiar with all types of cars, and at the same time be very useful in preventing the interruption of busy mechanics, by making oil changes, replacing filters, servicing air cleaners, changing or adjusting fan belts, and similar work. Meanwhile, he could be attending a good automotive course.

Many high schools offer automotive instructions, often in evening classes. Where this isn't the case, it is possible for a number of interested shops to work together and get the school to organize and offer a program. As a rule, the instruction in these classes is practical and capable.

Many cities also have commercial trade schools, offering intensive automotive training. Some, if not most, of these trade training establishments pride themselves on having teachers who've worked in the shop successfully themselves—so that they have real understanding of what the beginners must learn.

Of course, schools don't turn out finished mechanics. It takes a lot of "scratching" on the job to make a polished craftsman. But the schools do acquaint students with the language and the needs of the service field, and with automotive parts and assemblies; and give them some practice in the use of shop tools and equipment, along with the necessary theory. With this kind of a background, the beginner is off to a flying start on the road to craftsmanship.

Incidentally, the older man who's been around a good while but hasn't been able to soak in enough "know-how," can also take up a course—to the advantage of all concerned. His experience will allow him to start in formal studies further along, and to finish faster and "get more out of it."

Shops where the advantages of craftsmanship in customer work are understood, put a lot of emphasis on the training of mechanics. If there's a demand for specialized service—such as ignition and tune-up, body and fender or automatic transmission—the well-run shop will go beyond merely requiring general skills. It will take advantage of the many specialized courses offered by manufacturers of cars, parts, tools and equipment. These run from one day to about a week, and are keyed to the latest technical developments.

Technical and trade societies, too, sponsor special, and valuable instruction for both beginner and advanced craftsman. Good and continual "brush-up" on procedures and principles can be found in the trade magazines, and regular reading should be a habit for craftsmen.

With all these ways of correcting the situation, no shop can be excused for suffering from the shortcoming of untrained or ill-trained service men.

WHY BOTHER?

That's a common question in some shops—in fact in too many shops—among mechanics. Maybe the shop foreman or owner, whichever it happens to be, doesn't check out the jobs carefully. Maybe also, the motorist gets in his car and drives away without a word of either compliment or complaint—he doesn't seem to appreciate good work. Isn't it natural, some mechanics ask, to do the work only well enough to get by?

The answer they often give accounts for another familiar shortcoming in automotive craftsmanship—lack of incentive on the mechanic's part. Of course, there are better answers—which would lead to much happier results in the jobs these mechanics handle.

Every good automotive craftsman owes a good deal of his skill and success to having "sold" himself on his

The young man on the right route toward craftsmanship gets the right kind of training early in the game. This one took a high school course; now can be depended on for simple tune-ups.

field and his place in it. Once he's convinced that service work is the thing he likes to do best, it's only a short mental step to his having the proper incentive. Any tradesman can understand that, to get ahead, he has to be his own toughest critic.

Any man who has done a mechanical job knows if he has or hasn't put his best efforts into the work. If he has, he's learned something, or at least has polished a bit more, the skills that will bring him higher pay or a better position. In other words, when a mechanic does a good sound job, he is the greatest gainer.

Whether the shop owner, foreman, or the customer recognizes or praises the work, really doesn't matter in the long run. The service man has gained knowledge or practice, if not both. He's kept his work up to the best standard he can reach. In doing so, the mechanic has avoided the chance of picking up sloppy habits—that would hurt the quality of his work—and has increased his value to the service field; if not in his present job, then in a better one in the future.

Those who don't find enough incentive to do their best work, in this kind of an honest self-appraisal, aren't likely to "go very far" in the automotive service business. They lack the right incentive, whether they are owners, managers or mechanics. It would be best for the field if they left it as quickly as possible; and so help overcome one of the common shortcomings of the shops.

WHO'S ON FIRST?

How shop management itself works, has a powerful effect on the way jobs are done... in every respect. Poor management or supervision is another major contributor to lack of craftsmanship. When men are treated fairly, the building kept clean and orderly—and customer satisfaction ranked first on the list—the "climate" is best for top quality workmanship. Within the limits of their abilities and characters, the members of the crew will go "all out" to make every job perfect.

On the other hand, if the attitude of management is "take the customer every chance you get," and it "drives" the mechanics that way... you're most apt to find another of the conditions that work against craftsmanship. It takes the most skilled and the most conscientious of mechanics to do good work under a condition like that. Actually, poor shop management probably deserves to be ranked as the greatest enemy of the motorist—and the service establishment...because in itself it permits, and often causes, all the other shortcomings.

HOW CAN YOU DO GOOD WORK HERE?

Not only the "philosophy" of those who run the shop, but also the tools and equipment they provide, are included among the shortcomings that plague good servicing. Progressive shops "get their money back" many times over from special tools, test instruments and the necessary space and facilities. These things pay dividends in better work, as well as more volume of work. Their absence can handicap every service man, result in bad attitudes and in lower standards.

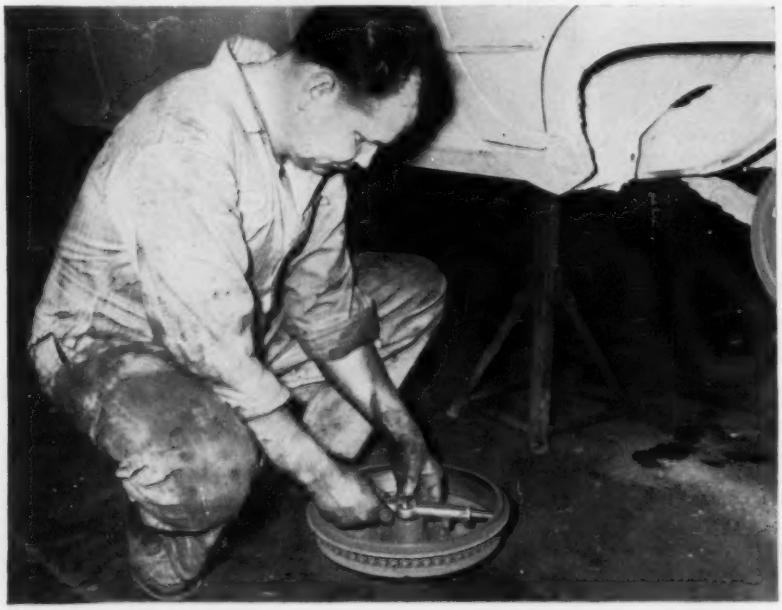
Any craftsmanship that comes out of a poorly managed, poorly equipped service shop is in spite of "long odds." However, the good mechanic faced with this situation reminds himself that he owes the motorist—if not the management—the most honest and able job he can manage to do. He will get the most out of the tools and equipment at hand... and will do his best to remedy the shop shortcomings by making well-thought-out suggestions for tools, equipment and other improvements. One of the means he'll use, incidentally, will be to pass articles and ads from trade magazines along to the heads of the business.

But even if there are a dozen top mechanics on the staff, a shop like this won't turn out top service and repair work until they "break through upstairs." Up 'till that time, its standards will be questionable.

WHAT'S IN IT FOR ME?

Low pay—or what the employe thinks is low pay for the work he does—can bring this question to the mechanic's mind whenever he comes up against a job that "takes a little something extra" in effort or thought. If the service man doesn't give himself the right answer, it's **again** the work standards and the car owner that suffer.

From the man who does only grease jobs to the highest paid car dealer service manager, income is certainly a natural interest. It's natural, too, for a discontented man to grumble and "pass up" anything that isn't absolutely



Brake work involves the customer's safety and perhaps even his life. It deserves the best in craftsmanship, and gets it in this case as the service man carefully checks the diameter of a drum, making certain it has not been machined excessively.

Specialty craftsmanship is as rewarding as it is demanding of top quality work. The men above do "land office" businesses in (left) machining, and outboard motor repair and rebuilding.

necessary to get the car out of the shop and on its way. Natural, that is—but not smart.

With today's wage scales where they are, the average mechanic's take-home pay is well below the "upper bracket." True as that is, the answer isn't to be found in poor work habits. In fact, the answer is just the opposite. Only by becoming more skillful and faster, adding to his knowledge of theory and practices, and raising his "batting average" on sound work, does the man in the shop up his income and improve his position in the field.

Going in this direction, he moves more toward the side of good craftsmanship. Once he reaches that point, the mechanic is in a good position. If he can't get what he knows is a fair return for his work in his present shop, he knows he can—easily—in another one. In addition to the satisfaction it brings to the man who has it, genuine servicing skill gives the mechanic the only practical cure for low income.

If he's working on a percentage of the customer labor charge under the flat rate system, he can do more jobs faster—make more money. Or, this man can take the specialist route—in tune-up, electrical systems, carburetor and fuel flow systems, front end alignment, body and fender. Any of these mean more income for the service specialist who is "really good."

Perhaps he'd rather "go on his own," open a general, or a specialty shop. This is the American tradition of independent enterprise—and popularly believed the best way to earn the niche in society and the "bundle of loot" that go with success. Probably the most important single factor in "making it" as an independent, is craftsmanship. New shops almost always have to capitalize most of all on superior knowledge and ability, and high standards.

All these cures for "pay roll blues" depend on the mechanic giving himself a simple answer to "what's in it for me?" He replies, "more money in the long run—if not here, then somewhere else." And he knows—or can be easily convinced—that the better he does the job on hand, the sooner he moves up in income.

"GREENER FIELDS"

Without the incentive and training required, no mechanic will go very far in the service field. His work will not be good enough. The shop where he works is in exactly the same position. It won't do well in customer satisfaction, loyalty and repeat business if its work suffers from the shortcomings in craftsmanship that are all too common today.

For those with the right attitude and the drive to keep up with its progress, the automotive service field is fascinating and dynamic. Its grass really is greener, in income as well as otherwise, than the fields on the "other side of the fence." That is, to men who have the interest and ability for good service work. On the other hand, automotive servicing is tough and unrewarding to anyone not willing to be completely honest with himself and his customers.

Most of the ills of a shop that "isn't doing well" can be cured by making good, sound craftsmanship the "must" on all jobs. The obstacles of poor training, poor management, lack of incentive; lack of tools, equipment and space, and low pay ... all can be "licked" without superhuman intelligence or effort. They must be overcome in any shop that is to keep up with the needs and the best practices of the service field.

Home Training Program in

AUTO MECHANICS

A comprehensive program which serves excellent for review or reference. Ideal for the man who has picked up a little here and there and wants to systematize his knowledge. Employers interested in sponsoring the program for selected employees can take advantage of tuition discount plan. Write for free information.

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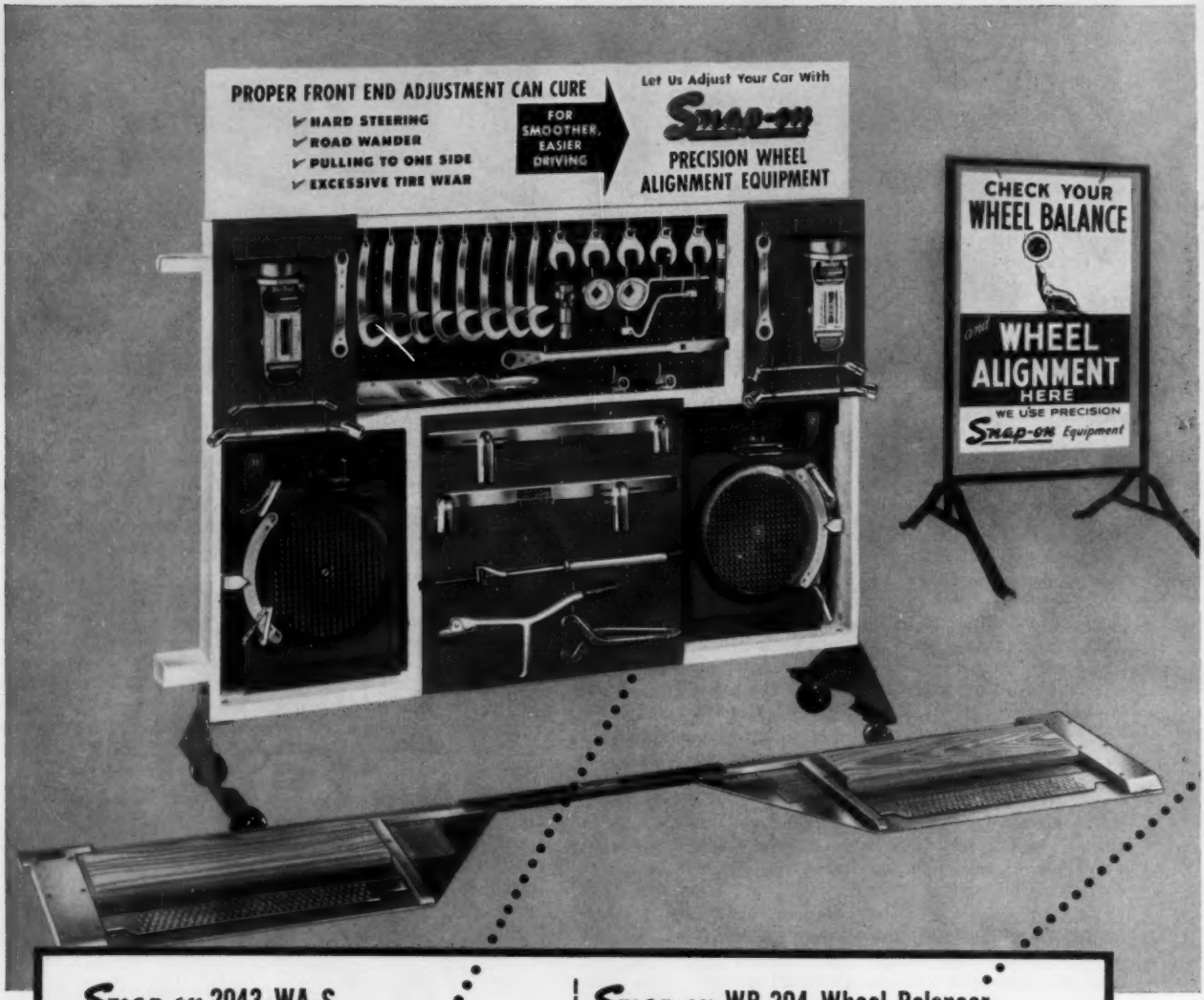


Snap-on 2043-WA-S

MASTER DELUXE WHEEL ALIGNING SET

So easy to use any mechanic can quickly become an expert. The set provides gauges, turntables and tools for checking and adjusting camber, caster, kingpin angle, toe-in, turning radius.

IT'S PROFITABLE — Use it on any level spot in the shop. Just paint position marks for turntables and toe-in gauge. Between jobs, space is available for other work.

IT'S SIMPLE — Anyone can easily read the precision-etched vials in the magnetic gauges and the clear markings on turntables and toe-in gauge. No complicated computations are necessary.

IT'S ACCURATE — The caster-camber-kingpin gauges magnetically grip the only machined surface of the wheel hub and center in the spindle center hole.

Snap-on WB-304 Wheel Balancer

INCLUDES BALANCER, SPINNER, WEIGHTS, PLIER

Fits all passenger cars and light trucks.

IT'S FAST — With this *Snap-on* wheel balancer, you can balance a wheel in three to five minutes.

IT'S ACCURATE — Shows you exactly how much weight you should add and just where it should be placed to make wheels run true and smooth.

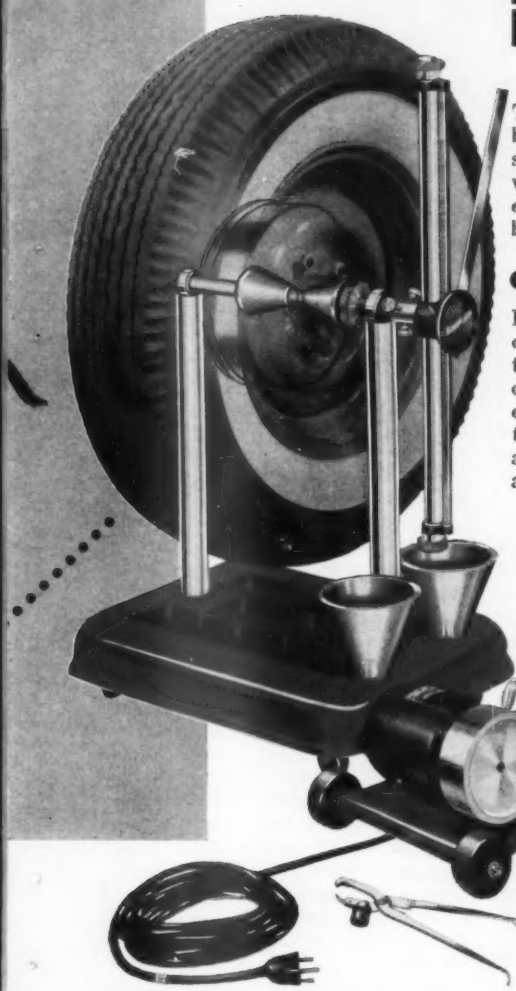
IT'S SIMPLE — Anyone who can read instructions can do a perfect wheel-balancing job with this equipment. No special training is needed.

IT'S LOW-COST — Every repair shop or service station can afford this low-cost, profit-making equipment.

PAYS FOR ITSELF — And pays you a profit by balancing wheels on the first fifty cars or less.

Profit Makers!

Snap-on® wheel aligner and balancer are big income boosters themselves, bring in other business, too



This *Snap-on* equipment not only brings in big profits on wheel work, but also helps you sell other services and merchandise. Industry studies show a tremendous boost in tire sales alone for shops installing wheel and front-end equipment. In addition, there are shock absorbers, tie rods, wheel bearings, support arms, kingpin parts, springs, brake jobs, lubrication.

Get Snap-on Equipment on Easy Terms

Low-cost, highly accurate *Snap-on* equipment pays for itself in short order — can return full profit to you in just a few months. It's simple to use and it's portable — does not tie up valuable floor space. Best of all you can own the complete wheel alignment and balancer set or either one separately on easy payments. A basic set substituting a toe-in trammel bar and angle gauge for the drive-on toe-in gauge is available at lower cost. A larger truck-size, drive-on toe-in gauge is also available.

Merchandising to Customers Pays Big Returns

Advertising this equipment with signs, local newspaper ads, and handbills pays big dividends. One operator stated, "I put handbills around the neighborhood and a sign up front the first week I installed my equipment. Boy! Did it pay off. I've never regretted the investment." *Snap-on* furnishes profit-building merchandising helps including wall banner, front-end check charts, certificates for wheel balancing and results pads. Metal curb signs are also available.

Get your share of this profitable wheel and front-end business now with low-cost *Snap-on* equipment. Remember — the *Snap-on* man who calls at your shop, is always available to answer questions and to help you get the most out of your equipment.

SNAP-ON TOOLS CORPORATION

8018-D 28th Avenue • Kenosha, Wisconsin

(Circle No. 134 on Reader Service Card)

Silicones in the service shop

● ONE OF THE "WONDERS" that sprang from distinguished military service into civilian popularity after World War II was a range of silicone products. Because of an amazing combination of desirable properties, the chemical family of silicones was swiftly put to a multitude of uses. Among these were many in automotive servicing. Shop men expected great things in lubricating, protecting and beautifying the customer's cars, from silicones.

Yet today, automotive silicone products gather dust on the shelves in many cases. Little is heard of them, although if they are as good as first pictured, silicones are needed more than ever in today's busy shops.

TESTING PROVES THEIR VALUE

According to Dow-Corning Corporation, the largest producer of silicones, these chemicals are every bit that good. To prove the point, the firm's researchers coat identical samples of weather-stripping with silicone spray, using brands "A," "B" and "C." All samples are then subjected to identical abrasive action by an arm-and-lever device.

Within five minutes, the "B" and "C" samples are completely ruined. But "A" still looks like new after an hour of the abrasive action.

The answer is simple. By analysis, the brand of spray used on "A" contains 99 per cent silicone; that on "B" only 16.2 per cent silicone; on "C," 0.5 per cent. The balance of these products consists of chemically inert material that serves as a "vehicle" in which the silicones are dispersed and held until "put to work."

Whether paste or liquid, this is the case with all silicone products that might be used in the service shop—they are made up of silicone plus the "vehicle" material.

Since only the silicone "works" to insulate or polish or reduce friction, how well the product does its job depends on how much silicone it contains. This is the explanation of the disappointments many persons have had in "trying out" silicones.

EXPENSIVE BUT VALUABLE

For these "wonder chemicals" are expensive, as well as valuable. Producing them involves extracting silicone metal from rock, then putting it through complex processing with costly chemicals. No wonder silicones command a good price. On the other hand, the material in which they are dispersed is inexpensive, as well as inert.

Using more "vehicle" and less silicone brings the price of the product down—but decreases its effectiveness, of course. Short-sighted cost consciousness has led to unjust conclusions about the true usefulness of silicones in the service shop, apparently.

SERVICE SHOP USES

For the average repair shop, a lubricant with a high silicone content is practically an ideal solution for many problems. Applied on weather-stripping and other rubber parts, the product will eliminate sticking and squeaking—and actually prolong the life of the rubber as well. Usually, one application lasts a season.

Fan belts can be treated with silicones to stop squeaking. Belt noise can become excessive, with some cars using up to five belts on an engine. Coating battery tops with silicones slows the formation of corrosion products; also eliminates electrical leaks, since the non-conductive silicones form a protective cover that seals in current.

In the same way, complete ignition systems can be sealed. Sprays *high in silicone content* will make ignition cables, coils, distributors, distributor caps and spark plugs, watertight.

Coating radio antennas with a good silicone preparation will seal out moisture and keep them telescoping easily. Spraying door locks will keep them lubricated and prevent freezing.

USEFUL ON REAR BEARING SEALS

In a recent Chevrolet Service Department bulletin, silicone lubricant is described as a means to enable a mechanic to replace an upper rear main bearing seal without removing the crankshaft. The pan is dropped, bearing cap removed and the remaining caps loosened enough to let the crankshaft come down slightly (a little assist with a pry may be necessary to break loose the piston assemblies).

The old seal is dug out with a sharp-pointed tool. A length of tag wire is wrapped around the end of the replacement seal, and the seal is coated with silicone lubricant. The free end of the wire is slipped over the top of the crankshaft and the seal pulled into place—after which the wire is removed, bearing caps installed and torqued, the pan replaced.

Another neat use for silicone lubricant is sealing minor leaks around windshields and rear windows. It stops capillary action, which can cause the most troublesome type of leak.

This list could be stretched on and on, all to the benefit of the average working mechanic. The important point about using silicones in the shop, however, is not *where* they can be used . . . it is, to be certain that it is *silicones* that are used—not an inert "vehicle" material with a light sprinkling of the "working" ingredient.

Photos courtesy Dow-Corning Corporation

Automotive Society Plans for Expansion

Organization of new chapters in a number of cities, and the launching of courses in specialized automotive service subjects, free to members, are among the activities the Society of Automotive Testers, Inc., plans to include in an expanded program. According to George Robinson, General Secretary, the educational nonprofit society believes there should be a chapter in every city of 25,000 population or more; and will assist interested service men in establishing local groups.

Membership includes service managers, tune-up specialists, top mechanics, shop operators and automotive teachers, parts jobber personnel and salesmen of automotive equipment. The Society's objective is the promotion of better servicing—particularly by encouraging the more general use of test instruments in trouble-shooting and diagnosis—and furthering the education of its members. Young mechanics who are ambitious and eager to learn are welcomed.

S.A.T. has chapters in fifteen cities at present, Robinson reports, and issues a monthly Bulletin, summarizing the program of the parent, Chicago Chapter and also presenting helpful technical information and tips. Chapters meet once a month for a technical program, which is usually a talk on some phase of service or a type of automotive equipment, followed by a discussion period. The proposed training courses will cover such subjects as the Carburetor, Engine Mechanical Service, the Charging System, Shop Instrumentation.

Detailed information about the Society and its activities is available from George Robinson, Secretary, 2056 Ruby St., Melrose Park, Illinois.

If Heater Doesn't Heat Check Control Thermostat

Should a car owner complain that the Instant Comfort Heater in his 1959 DeSoto does not give sufficient heat, it may be that the heater temperature control thermostat is improperly adjusted. Where this condition is encountered, the DeSoto Service Department recommends that the following two items be carefully checked and adjusted before any further correction is attempted.

1. The Bowden wire should be installed on the temperature control lever tang so that the *first loop* of the coil which forms the end of the Bowden wire is installed on the tang toward the lever handle.
2. The thermostat on the heater engine side housing should be adjusted as follows:
   (a) Loosen the Bowden wire set screw on the thermostat lever.
   (b) Move the temperature control lever on the instrument panel to the full heat position (extreme right).
   (c) Rotate the thermostat control lever to the extreme clockwise end of its normal travel, when viewed from top (do not force against stop), and tighten set screw.

This adjustment will assure that the thermostat is at its maximum heat position when the temperature control lever is set at full hot. However, if the heat supplied by the heater is insufficient after the above adjustments have been completed, a new thermostate (Part No. 1972883-P) should be installed.

Plymouth Drops Dip Stick On Power Steering Pumps

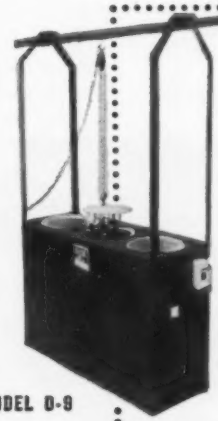
With the dip stick now omitted from the filler cap on all power steering pumps, Plymouth states that with the engine cold, oil level should be at bottom of filler neck; with engine hot, oil level should be one-half way up in filler neck.

"Still Taking the Country 'BUY' Storm!"

S-V CAMSHAFT GRINDER

Storm-Vulcan built the first camshaft grinders for engine rebuilders and automotive machine shops. The engineering design of Storm-Vulcan Camshaft Grinders assures accuracy within .001" of lift and 1° of specified timing. Camshafts ground on the precision engineered S-V Camshaft Grinder assure you the best engine performance.

MODEL 75



MODEL D-9

DURALUBE LUBRITE PROCESSING UNIT

Storm-Vulcan Model D-9 Lubrite processing gives lasting life to reground camshafts. The Lubrite process is an acid etching which opens the pores of the metal and affords positive lubrication. Eliminate camshaft failures with the use of the S-V Duralube process on every reground camshaft!

Every Rebuilt Engine Needs an S-V Reground and Lubrited Camshaft!

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Refinishing pitfalls—causes and cures

With the many possible defects that can show up in a paint job today, it is more important than ever for the bodyman to stick to the paint manufacturers' instructions, if he and his customers are to reap the benefits of the highly improved, modern finishes.

• THE MODERN FINISHING MATERIALS used on automobiles and trucks have been constantly improved, and at this time they are the most durable and best looking surface coatings that have ever been available. It is well known that steel is the strongest and most adaptable material that can be used for automobile body construction. At the same time it is equally well known that unprotected steel is subject to rapid corrosion. Oxidation (rust) is the worst enemy of steel, though acids, some alkalies and in some cases electrolysis also attack the steel surface.

APPLIED UNDER IDEAL CONDITIONS

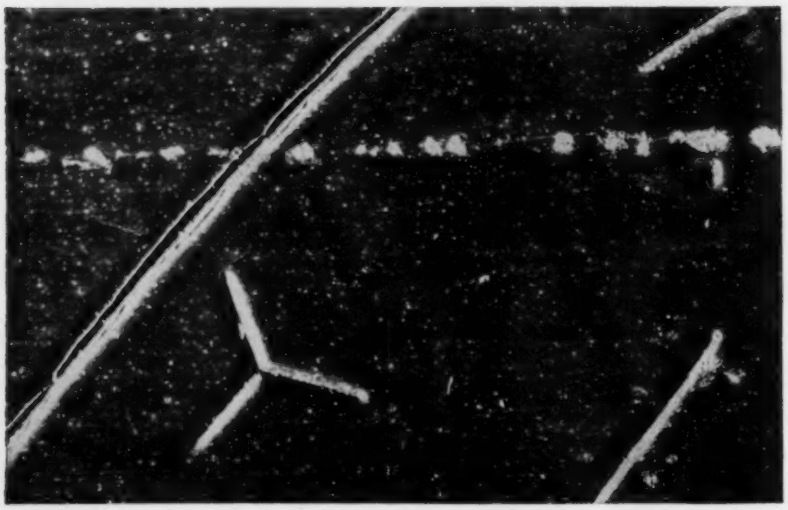
The original factory finish is applied under scientifically controlled and technically correct conditions so that in general, this finish is attractive in appearance and has a long service life, if given reasonable care. But refinishing is required on various parts or the complete body for various reasons from time to time. When metal work is required, due to an accident, either the original finish is removed in the course of the repair work or replacement parts may be required. In either case, repainting is necessary. Then there is a considerable amount of complete car repainting because of fading, excessive chalking, or other causes.

Refinishing work is seldom done under ideal or fully controlled conditions. Therefore, defects of various kinds may creep into the finishing operations, which show up later in the paint finish. Knowing where particular care is required, many unsatisfactory jobs can be avoided. Troubles due to the finishing material itself are beyond the control of the operator, and in such cases all that can be done is to select the materials with care and obtain them from reliable sources. Troubles due to poor surface preparation, careless surface cleaning, improper handling of the finishing material, allowing insufficient drying time, dirt and dust, careless application, incorrect temperature conditions, excessive humidity, improper mixing, unsuitable thinners, etc.—these can be controlled by the operator; and all factors must be watched in order to get finishes that match adjacent areas, that will have satisfactory gloss and smoothness, and will have a satisfactory service life.

In the following paragraphs, we will consider the various defects and paint troubles that any painter may run into at times; their causes, and the remedies that will correct or eliminate them on future jobs.

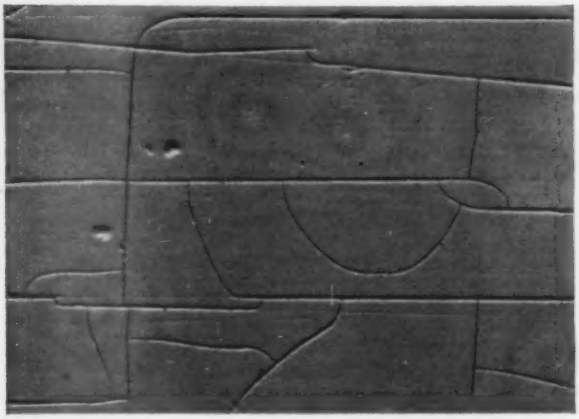
LOSS OF LUSTRE OR DULLED FINISH

There may be a tendency for a finish to lose its lustre quickly for two reasons. One is the use of an inferior lacquer or enamel, and the second is because of rubbing

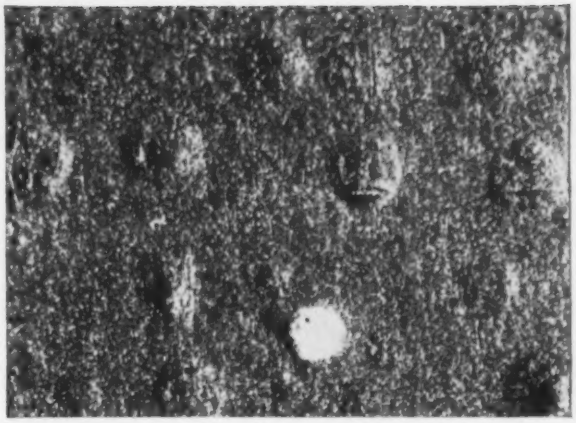


By GUY F. WETZEL
Technical Editor

Enlarged view of painted surface showing line cracks and crow-foot checks.



Line and figure checks. Note how these checks form an overall pattern.



Blisters in the paint film, enlarged so the effect may be clearly seen.

up before being thoroughly dry. When the loss of lustre occurs after the vehicle is put into service, it may be due to the use of an inferior touch-up material or to unusually severe conditions of exposure.

Films of finishing material dry from the outside inward, so that even if the surface appears to be thoroughly dry, it may be dry only on the surface. For this reason it is highly advisable to closely follow the directions supplied by the maker of the material and to allow drying time at least as long as specified for the material, and preferably somewhat longer before any polishing is done; especially if the temperature is below 70°F in the area where the job happens to be.

The lustre may also be destroyed through the use of soaps, caustic cleaners, and unsuitable polishes. If a good clean-up with paste cleaner and liquid polish do not help restore the lustre, refinishing is the only remedy.

CHALKING

Chalking has been one of the characteristics of automobile lacquers and enamels almost from the time of their first application to steel covered bodies. It is still the most discussed of complaints about finishes and there is considerable confusion in regard to it. It can be defined as a surface disintegration, due primarily to the effects of weathering, the most active element in weathering being sunlight. All enamels and lacquers show some chalking when exposed to sunlight, but the amount of chalking to which the given finish is subject will vary with the amount of exposure and also with the color. The first indication of chalking is a dulling of the surface, followed by a slight powdering of the surface, which may be removed in part by rubbing with a cloth. Cleaning the finish with a suitable polish will remove the surface chalking and restore the finish to its original lustre.

When considering chalking, the important point is the extent of the condition, rather than whether the condition exists, as all finishes will chalk to some degree. However, one of the desirable characteristics of the relatively new acrylic materials is their resistance to chalking. The same film exposed in different parts of the country will show different degrees of chalking and different colors may show variations in a given locality. Different cars in the same section of the country will show variations, even when painted with the same lacquer or enamel, depending on the care given the vehicle and the type of usage.

If a customer complaint about chalking should be received, a comparison should be made with other cars of similar colors, of approximately the same age, and painted

The effect of rust under the finish. Notice how spots raise up, breaking the paint film.

with the same material to get an idea as to the justification for the complaint.

For heavily chalked jobs, use a paste cleaner or a light rubbing compound followed by a liquid or paste polish. If the situation is severe, the job should be refinished.

BRONZING

This is a very fine form of chalking in which the individual particles of the pigment are crystaline, and when viewed from an angle produce the iridescent effect called bronzing. Some colors, particularly deep blues, are subject to this condition. It is purely a surface condition which is easily removed with liquid polish; but this is only a temporary remedy, as the condition will recur. While not serious, it is a condition inherent in the pigment used for certain colors. Even though considerable finishing material appears to come off in the polishing operation, there is little danger of the film being worn through, as an extremely small amount of pigment will discolor a lot of the cleaning rag.

The remedy for the condition is to clean and polish as often as necessary to get rid of the bronzed appearance.

COLOR CHANGE OR FADING

As chalking often causes a change in color until it is removed, it is frequently complained of as fading. Therefore, no complaint about fading should be taken too seri-

(Continued on following page)

ously until the finish has been carefully cleaned and polished. It is exceptional if any paint does not show some change in color over a period of time, but the amount of change will vary with the color, as some pigments are much more stable and permanent than others. If the color change is uniform all over the car, and there is some question as to the amount of color change, the only way to check it is to compare it with some other car finished with the same color. The car used for comparison should have been in service a different length of time.

There is no remedy for actual fading, which will restore its original color. The only alternative is to repaint the entire car.

CRACKING AND CHECKING

When either cracking or checking appear, the cracks and checks may extend all the way through the finish film to the metal; only part way through the film to the undercoat; or may be a depression in the film produced by a crack in the undercoat. But in any of the three cases mentioned, the difference between cracks and checks is that cracking usually refers to single line cracks or single definite figures or large shapes, while checking is a multiplicity of these same lines or figures, producing smaller figures or shapes and resulting in a pattern or design. The cause of checking can often be determined from the pattern, as definite causes will produce definite patterns.

Ordinary line cracks are due to applying too many coats of finish without allowing sufficient drying time between coats. Simple line cracks may result from temperature stresses, movement of body panels or straight shrinkage cracks due to a short film or one that has been coated over before thoroughly dry. Line cracks are also due to poor stirring or failure to incorporate all of the binder back into the mixture in the same proportions as originally manufactured. The use of an unbalanced thinner or one containing an insufficient amount of solvents will produce the same effect.

Line checking and figure checking are other common types of cracks or checks. The causes of these, in many cases, are quite involved and require considerable knowledge of paint chemistry to be thoroughly understood. They can be avoided in refinish work by the use of dependable materials, thorough stirring, and carefully following the manufacturers' directions as to the correct drying periods.

The remedy in all cases of cracking or checking is to remove the defective finish right down to the bare metal for an area considerably larger than the affected area, and rebuild the finish strictly in accordance with the correct procedure in all respects.

WET SPOTS

Every once in a while the painter will have a job which does not dry thoroughly all over, and those spots which do not dry at the same rate as the rest of the finish are known as "wet spots." They are generally due to some wax or grease on the surface over which the finish was sprayed, or a film left by sanding with gasoline containing tetraethyl lead or top oil. Excessively heavy coats of undercoat will sometimes cause wet spots.

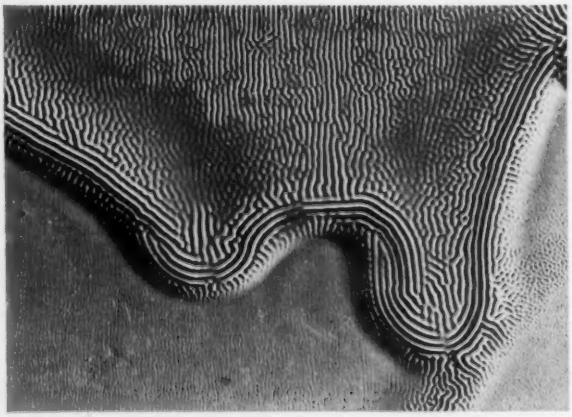
There is only one remedy when wet spots occur, and that is to remove the affected areas and refinish, observing all the correct precautions and proceeding strictly according to instructions.

RUST UNDER THE FINISH

There is little excuse for rust under the finish, but sometimes careless disregard of cleaning precautions will bring about this condition. Cleaning preparations are available which will remove rust before applying the primer or primer-surfacer. There have been constant improvements in the methods available for preventing rusting. Among these methods are ways of removing rust that is present when the job is being prepared for painting and to retard the formation of rust after the car is put into service. Rusting of the surface of the metal before the paint film is broken is usually made apparent by raised sections of blisters. After the film is broken, the rust eats back under the edges of the paint film. Some of the rust preventive systems are similar to rust in color and may be mistaken for rust unless it is carefully examined.

The remedy in cases of rust under the finish is to remove the old defective finish, treat the bare metal with a good rust remover solvent, and refinish in accordance with approved practices.

Peeling, such as shown here, may take place anywhere on a painted surface, but it appears more often along edges of mouldings, joints between body sections, etc.



Enlarged view of wrinkling in synthetic enamel coat. This is generally due to applying too heavy a coat of finish.

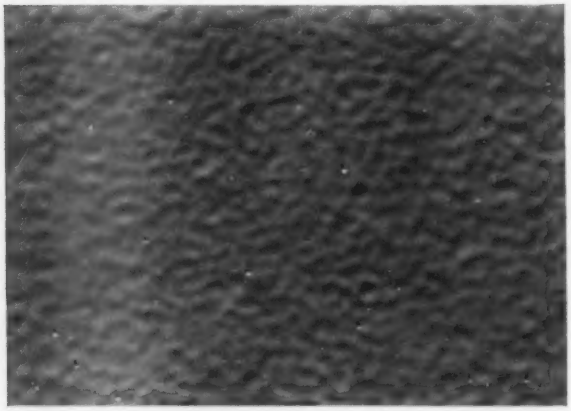
DIRT IN THE FINISH

Synthetic enamel requires 15 to 30 minutes to dry to a dust free surface. This length of time permits the newly sprayed film to pick up lint and dirt, thus producing a film with specks of dust in it which is more or less typical of any enamel finish. Even under washed air conditions these very tiny particles find their way to the wet film and cannot be dislodged until after the film is hard. Lacquer films also pick up the same kind of particles, but

as the lacquer film dries faster, the surface catches less dust, and the particles are removed in the subsequent rubbing and polishing operations.

Synthetic enamels can be rubbed and polished in the same manner as with lacquer after the enamel is thoroughly dry, which takes at least 48 hours. The surface is first flushed with water to remove any abrasive particles and then a liquid polish is used. This is followed by the use of synthetic rubbing compound, which is finer in grit than lacquer rubbing compound, and should not be confused with it.

In actual practice it is seldom that an enamel finish is rubbed, because the reason for using enamel in the first place is to get a good gloss finish without rubbing. If the surface dust picked up in the drying process is objectionable, the only remedy is to rub out the finish.



Typical orange peel surface. This is due to poor adjustment of the spray gun, use of wrong thinner or insufficient reduction of the material.

Peeling over a solder spot, as shown here, is the result of careless cleaning of the soldered area before applying paint.

In cases of extreme roughness due to dust, it is advisable to wet sand the surface with No. 600 sandpaper and follow with compound and liquid polish. When using either 600 paper or rubbing compound, care should be used not to put too much pressure on the surface.

If the undercoat shows, this may be due to either insufficient film thickness or from the frequent use of an abrasive polish. The remedy is to clean up with wax and grease remover and respray the color coats.

BLISTERING

Rust is generally considered to be the cause of blistering, but there are cases now and then where blisters occur without the presence of rust. Among these are excessive moisture or other foreign materials getting between the paint coats, causing them to separate. Condensation may be blown onto the body from under mouldings when the car is sprayed after standing unprimed overnight. Oil or water in the air lines will also produce blisters. So when blistering complaints are received it is necessary to carefully examine all possible causes and contributing factors.

In localities where there is frequent high temperature and high humidity, pimpling or blistering may result. No paint film is entirely impervious to moisture so that occasional failures from this cause are unavoidable. If and when they do occur the car owner must be made to understand that such failures are not the result of poor workmanship or material, but simply deterioration due to use that will have to be repaired at his expense.

Excessive polishing or the use of abrasive cleaners will reduce the paint film thickness to a point where it becomes less impervious to moisture and leads to blistering more rapidly than a full thickness of finish.

The remedy is to remove the finish down to the bare metal and refinish properly.

PINPOINT BLISTERING

Complaints about this trouble are often confused with pitting because the small broken blisters have the appearance of pits in the finish. However, pitting is an entirely different condition. In the early stages the condition is known as pimpling because the small blisters, ranging in size from the size of a pin head down to small points are raised and present the appearance of a rough finish. When the points of the blisters are knocked off in polishing or by any other means, the result is a finish with a very large number of small holes in it which, in reality, are just small blisters.

The remedy is the same as for large blisters—remove the finish down to the bare metal and refinish.

PITTING

Water or oil coming through the air line and being deposited on the surface with the paint will often cause pitting. As the paint will set before the water or oil can evaporate, the result is a number of small depressions very much like tiny craters.

The only remedy for this condition is to sand down to a smooth surface and refinish. It can be avoided by being careful to keep water and oil out of the air lines.

PEELING

A lack of adhesion will cause peeling. The lack of adhesion may be between the finishing coats or between the finishing coats and the surfacer or primer; or the entire film may have poor adhesion to the metal. If only a portion of the film is coming off it is necessary to know which coats are separating. This can be determined by careful examination, using a 10-power magnifier, if necessary. If all the paint film is peeling from the metal it is probably because oil, grease, wax, rust or other foreign material was not properly removed before spraying the primer or primer-surfacer.

The remedy is to clean up the whole area and refinish.

ORANGE PEEL

Orange peel is a dented or pebbled effect on the paint film, and gets its name from the similarity to the surface

(Continued on following page)

How pitting or cupping appears in the paint film.

of the skin of an orange. This may result from several different causes, the most common of which are solvent selection, insufficient reduction of the material, and the amount of air pressure on the spray gun as compared to the amount of fluid being sprayed.

By properly thinning the finishing material, correctly adjusting spray gun for both the amount of material to be sprayed and the air pressure, and holding the gun at the proper distance from the work, the orange peel effect will be reduced to a minimum.

A thinner which dries too rapidly will produce orange peel and spraying lacquer on a hot surface will also produce a rough surface. Orange peel and roughness result from a quick drying effect with insufficient time allowed for flow-out. Using the proper kind and amount of solvent will eliminate this difficulty.

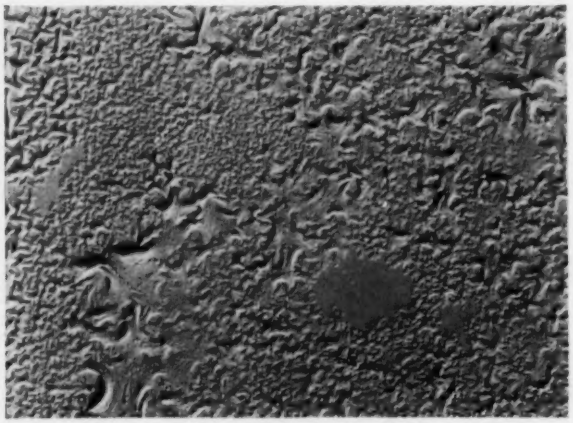
Orange peel is present to some extent on all sprayed surfaces, but the normal cleaning operations, aging and complete drying will gradually cause the condition to disappear.

WRINKLING

Lacquer is not subject to wrinkling, but synthetic enamel will often be subject to this defect. In nearly every case this is due to the application of too-heavy a coat. Abnormal drying conditions and extremely hot weather will sometimes cause the material to surface dry very rapidly while the balance of the film remains soft, and this causes wrinkling. To avoid wrinkling, spray sufficient material to thoroughly cover the surface, but try not to build up too heavy a coat in one operation. If the material is thinned and sprayed according to directions, there will be very little trouble from wrinkling.

The use of a fast thinner in warm weather will lead to the application of very heavy coats which will surface dry too rapidly and cause wrinkling. Also, the lack of sufficient thinner will produce the same effect.

Lifting is usually due to applying a coat of material carrying strong solvents over a partially oxidized layer of lacquer or enamel.



PEELING OVER SOLDER SPOTS

When a job has been leaded and is to be repainted, it is necessary to very carefully clean over the soldered area. If this is not done, the first effect, noticeable in a few weeks, will be dulling or loss of lustre of the finish. The break-down of the finish will progress until the film becomes hard, cracks open, and finally separates from the metal.

To avoid this, clean the soldered area with a mixture of equal parts of ammonia, alcohol and water; then wipe clean with a clean cloth, and allow time to dry thoroughly. If the job is to be baked, be sure to allow time for the pores of the solder to dry out completely to avoid pin holes in the finish.

Stone bruises and chipping are caused by material being thrown up against painted surfaces. The more brittle the finish the greater the damage caused by this action.

LIFTING

The puckered and wrinkled effect, usually resulting from applying a coat of material carrying strong solvents over a partially oxidized layer of lacquer or enamel, is called lifting. The strong solvents partially dissolve the older film and destroy its adhesion to the surface underneath. Adhesion may also be destroyed by the presence of some foreign material due to lack of proper cleaning of the surface, though this does not have the wrinkled appearance of lifting.

Painting over a surface from which all the wax has not been removed will cause a lack of adhesion. Automotive type baked enamels or air dry synthetic enamels after they are thoroughly oxidized (which takes from 60 to 90 days), are not usually soluble in ordinary lacquer thinners. However, some of the oleo-resinous enamels of the type used for household applications are very susceptible to lifting by the strong solvents used in lacquers.

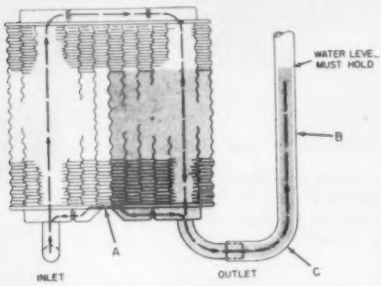
Some lacquers contain oxidizing resins or oils and will lift if they are recoated with another lacquer. Swelling of sand scratches is also encountered now and then. This is a very mild form of lifting. Lifting will also take place

(Continued on page 78)

Broken Lower Tank Seal Reduces Heater Efficiency

The factory approved fresh air heater for Willys CJ-5 and 6, Utility Wagons and Trucks has a U-flow core.

A sealed area between the lower tank and core (point A) is designed to prevent the coolant from entering the outlet side of the lower tank before it has been forced through the core in



the proper manner. In some cases the lower tank seal may allow coolant to pass from the inlet to the outlet tube without going through the core (dotted flow line). Where this condition exists, heater efficiency may be greatly reduced.

To check for this condition on CJ-5 and CJ-6 models, the heater must be removed so core can be placed in an upright position. On all other models, the test can be conducted with heater installed.

1. Remove outlet and inlet hoses and allow core to drain.
2. Attach a hose (B) to outlet tube. Position as shown with top of hose one inch below bottom of upper core tank.
3. Pour water in hose B until filled. Be sure connection is tight and there is no restriction at bend C.
4. Allow to stand for five minutes. If water level in hose holds, core is satisfactory. If water level recedes, core is defective.

The factory recommends that this core test be made before installing new heater units, to make sure the core in the replacement unit is satisfactory.

Not Good Policy to Add Grease to Wheel Bearings

Wheel bearing greases commonly contain either sodium or lithium soaps and, therefore, are *not* compatable. Mixing these two types of greases may result in a semi-liquid that has very poor lubricating qualities.

Wheel bearing greases made with either substances are satisfactory when used alone. However, inasmuch as it is not always possible for the service man to know what the greases contain, it is strongly recommended that grease never be added to that already in the wheel bearings.

When additional grease is needed, or upon reaching the 10,000 mile inspection period, all grease should be washed out of the hub and bearings with clean solvent and the parts dried with compressed air.

A point of caution when cleaning bearings: Never spin bearings with compressed air while drying or damage to the race and rollers will result due to close fits and lack of lubrication.

After cleaning, inspect bearings and races for cracking, flaking, brinelling or excessive wear. If found satisfactory, thoroughly repack bearings and hubs with new grease. In this connection, it is recommended that some space be left in hub between inner and outer bearings for grease expansion to prevent grease from leaking out of seals.

Noisy Steering Column

A scraping noise in the 1959 Edsel steering column while turning the wheel may be due to the horn ring contact brush and insulator rubbing against the horn ring contact plate. Applying a light coat of Lubriplate to the horn ring contact plate will eliminate this noise.

Shurhit
World's finest Ignition
tune-up starts at the heart of an ignition system
The pulse beat of an ignition system starts at the distributor where both points and condenser should be replaced. The contact set illustrated above is Shurhit's new externally adjustable Set 100, designed for replacement use on 1956 Cadillacs and Oldsmobiles and on all General Motors passenger cars for 1957-58-59.
It is precision engineered with matched points, extra large contact area, stainless steel spring and has a positive ground connection. The breaker point portion of the assembly is readily removable for economical replacement.
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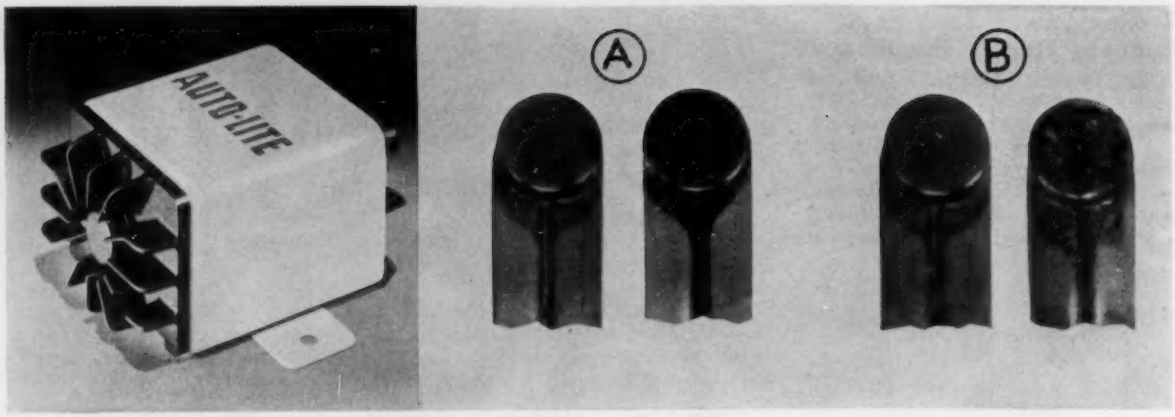


Contained in a single unit (left) is the transistor, special circuits and other features of Auto-Lite's new development. Right: Distributor contacts (A) of transistorized ignition show no signs of bluing after 1500 hours of testing. Contacts of conventional system (B) suffered extreme bluing in same heat.

Transistorized high voltage ignition

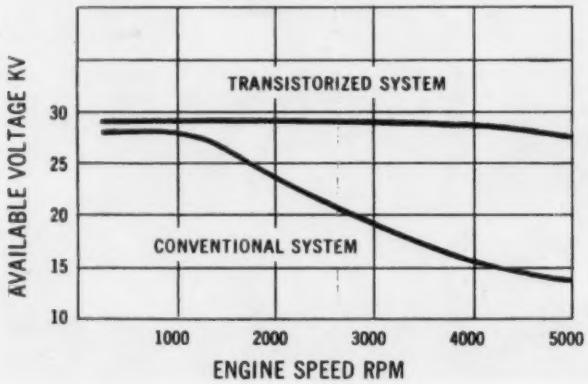
• SPECIAL CIRCUITS and other features of a new voltage transformer developed by Auto-Lite, realize for ignition use the unique ability of transistors to switch large currents through the action of a small control or relay current. The base circuit of the transistor carries this current and is triggered by the distributor contacts, thereby timing the firing of the transistor switched transformer to the engine. The distributor contacts function in their normal manner except that they carry a greatly reduced current load and, through the action of the transistor set off a chain reaction that makes it possible to deliver greatly increased voltage to the spark plug.

LIFTS DESIGN CEILING

By making substantially higher voltages available at the spark plug in a practical manner, this new system lifts the design ceiling imposed on engine designers and fuel makers by the conventional ignition system. Inherent in the design is the capacity to produce even higher secondary voltage when needed.

The device incorporates the transistor, its heat sink, the transformer and associated circuitry in a single package with two primary terminals and a secondary high tension tower as in an ignition coil. The maker states that the new system is completely compatible with other conventional automotive electrical components and has immediate as well as long range significance to motor vehicle and other applications.

Comparison of new ignition system's output with conventional system. Transistorized system output is equal to battery ignition at low speeds and magneto ignition at high speeds.



MAINTENANCE-FREE IGNITION

The new system is said to provide maintenance-free ignition, lifetime distributor contact service and eliminate condensers. Starting failures and poor starting due to "blued" contact points are eliminated. Top ignition performance for the full range of engine speeds is obtained with the new system. Conventional ignition system output is often 50 per cent less at high speeds than at low speeds, according to Auto-Lite reports, but with the new system, constant top voltage is provided at all speeds.

Because the new system offers dependable starting, reliable performance, minimum repair and peak efficiency at all speeds, Auto-Lite states that it will have immediate application on industrial engines, marine engines, military vehicles, commercial fleets, farm equipment and wherever system longevity and superior performance is demanded. In these applications the initial cost of the new system is outweighed by its savings in operational expense. It will be priced in the range of power steering and will be available for the public first as special equipment for private car owners who seek top engine performance.

MANY POSSIBILITIES

Other design implications include the possibility of universal heat-range spark plugs with substantially longer life, transistorized regulators and other applications of transistors in automotive electrical circuits.

The new system can be installed in any battery ignition system by removing the coil and condenser from the existing system and mounting the new transistor switched transformer.

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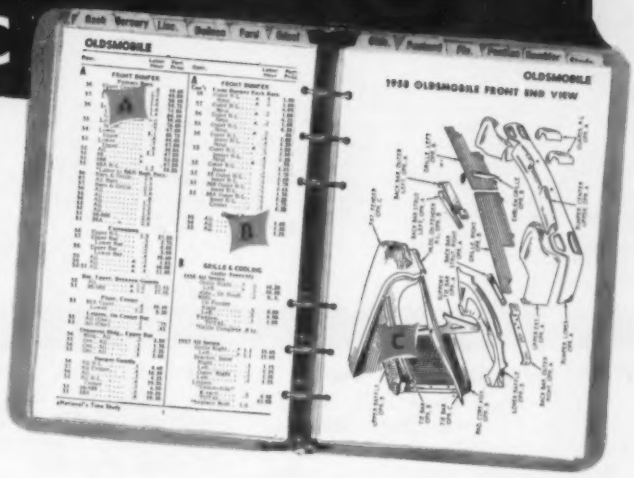

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Wheel Dolly Simplifies Towing

A new type wheel dolly is announced by the Weld Built Body Co., that is said to solve the many problems confronting operators of towing equipment; such as towing total

wrecks or cars with automatic transmissions or air suspension.

The Wheel Dolly is in three parts and can be assembled in two minutes. Features of the unit are safety chains and three adjustable positions that will accommodate any type car to permit towing at road speeds up to 50 m.p.h. Weight of the dolly is approximately 140 lbs.

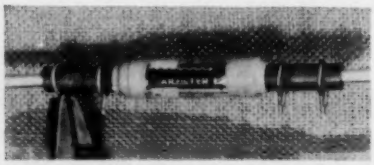
(Circle No. 1 on Reader Service Card)

Fuel Filter Fits in Gas Line

A space-saving ceramic and magnetic gasoline filter designed for installation directly into the fuel line of any automobile or inboard marine engine, or outboard motors with auxiliary tanks, was recently announced by the Carter Carburetor division of ACF Industries, Inc.

Known as the "Carfilter," the unit takes up virtually no space in the engine compartment because of its cigar shape; yet it is said to perform the complete filtering function—ridding fuel of harmful dirt and iron oxide particles, thus preventing clogging, flooding and stalling that cause loss of power and mileage. Developed and field-tested over a two-year period, the "Carfilter" is being packaged individually with hose fittings and clamps to simplify installation by the service man. A special tube-cutting tool is also available.

Carter engineers who developed the

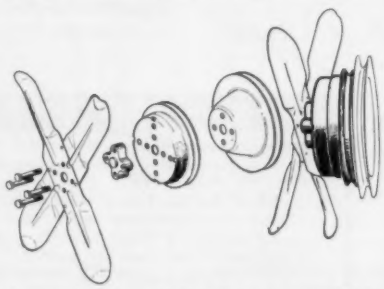


device explain that if the filter should become clogged by foreign material, a built-in by-pass pressure relief valve allows passage of sufficient gasoline to run the engine until the filter—which is disposable—can be replaced. The 40-micron fine-texture ceramic filter allows filtering in "depth" rather than only on the surface area. A magnetic trap catches otherwise unfilterable iron particles.

(Circle No. 2 on Reader Service Card)

Auxiliary Fan Pulley

An auxiliary fan pulley designed to fit nearly all automobiles and pickup trucks without interfering with existing pulleys or belts, is now available from Brake Parts Specialty.



No drilling, machining, cutting or welding is necessary . . . remove four bolts that hold fan . . . place auxiliary pulley next to existing water pump pulley . . . replace fan and bolts and you have a power source to operate any equipment such as air compressor, 110-volt generator or what have you.

(Circle No. 3 on Reader Service Card)

Brake Shop on Wheels

Barrett Equipment Co's B-6 and B-7 Series portable brake service shops are equipped with the B-500

Drum-Dokter Lathe and a choice of either a B-75B True-Arc Radius Grinder or the B-105C Brake Dokter for shoe fitting. Either unit is functional in every respect for work in-or-out doors.

(Circle No. 4 on Reader Service Card)

Windshield Washer Anti-Freeze

United Motor Service is now distributing Delco Special 15 Anti-Freeze, a newly developed chemical solution which is said to permit operation of any automobile windshield washer at below freezing temperatures.

According to U-M-S, Delco Special Anti-Freeze prevents the freezing that occurs in jars, hoses and nozzles to cripple automatic windshield washers in freezing temperatures, or which causes the solution to form a foggy, icy film on windshields.

One pint added to two pints of water is said to provide high efficiency windshield washer operation at zero F. United Motors emphasizes, however, that the solution is not intended for all-season use.

(Circle No. 5 on Reader Service Card)

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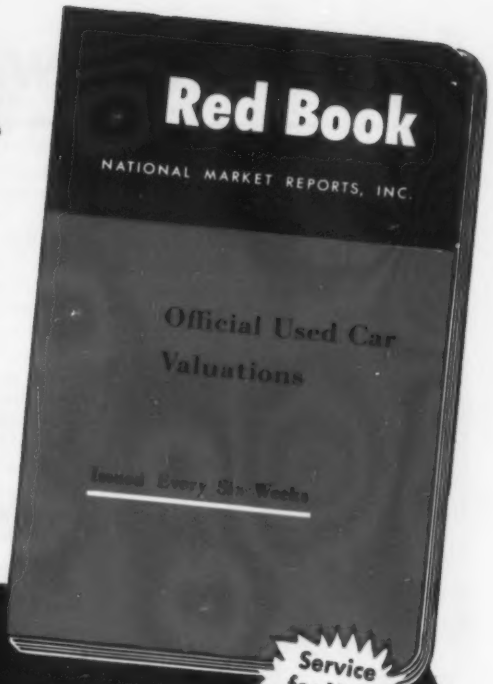

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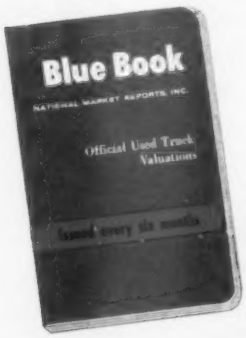

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- ☐ National Auto Parts and Labor Manual, Import Cars, including year's revision service $12.50
- ☐ Blue Book Official Truck Valuations $10.00
- ☐ National Tractor & Farm Implement Blue Book ..... $ 5.00
- ☐ Automotive Service Digest—Monthly—For a Full Year ..... $ 4.00
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OR OTHER LINE OF BUSINESS _____ RB-E

These are new *manufacturers' products*

Low-Priced Polishers

Two new heavy-duty electric polishers have been introduced by the Black & Decker Mfg. Co. for use in automotive appearance reconditioning. They are the No. 99-1 Heavy-Duty Electric Polisher and the No. 97-1 Heavy-Duty Automatic Polisher.

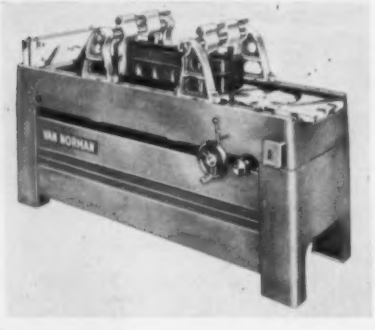
The No. 99-1 Heavy-Duty Polisher, weighing only 10½ lbs., is constructed for heavy-duty operation, with ball bearings used throughout for continuous production service. It includes a super-flexible backing pad for getting into tight corners, and a long-lasting polishing pad. Powered by a Black & Decker-built polisher motor, the unit provides ideal torque and speed factors for polishing.

The No. 97-1 Heavy-Duty Automatic Polisher offers these same built-in features and standard equipment, plus the exclusive Black & Decker automatic feature which permits operator to apply polish directly to the car's surface from the polisher, itself. The 11⅜ lb. unit is equipped with a reservoir and a thumb operated pump which eliminates stopping for hand application of polish.

(Circle No. 6 on Reader Service Card)

Head and Block Resurfacer

Van Norman's recently announced No. 570 Rotary Broach is said to resurface cylinder heads, engine blocks, etc. to the precision tolerances that assure a perfect gasket seal and help restore new engine performance.



An exclusive built-in loading table permits fast top-side set-ups, directly from the machined surface of the work, and keeps the chips out. The manufacturer emphasizes that levelling devices are not needed, and there is no limit to the height of work; in fact, only two sets of holding fixtures handle passenger car and truck heads and blocks without complete disassembly.

Other features of the machine include automatic straight line traverse and micrometer up-feed control, and carbide-tipped cutters that can be replaced, sharpened and aligned individually by the operator at any time.

(Circle No. 7 on Reader Service Card)

Window Screen for "Wagons"

Announced by Chrysler MoPar is a Back Window Screen for 1957-'58-'59 Chrysler-made Suburban Models to provide desirable back window protection plus ventilation. The fine mesh aluminum screen and frame is backed up with an expanded aluminum reinforcement visible in the illustration.

When the back window is raised to meet the screen, the tailgate is automatically in a locked position. With the window in its down position, ample room is provided for opening tailgate. Slides in or out of window channel in a matter of seconds and does not hinder rear vision.

(Circle No. 8 on Reader Service Card)

"Speed-Kote" Spray Line

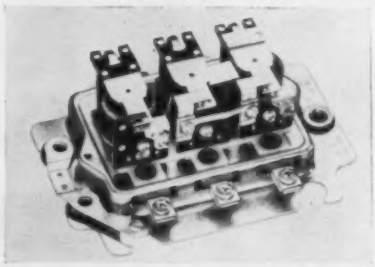
A completely new line of spray can products for automotive use is announced by the Speedex Mfg. Co.

Trade named "Speed-Kote," the 16 oz. push-button spray can items include a spray-on and wipe-off upholstery and leather cleaner; a penetrating oil; auto wax and polish; a battery terminal spray; an ignition system waterproofer and a white sidewall tire spray.

(Circle No. 9 on Reader Service Card)

Double-Contact Regulator

Leece-Neville Co. announces a new double-contact regulator for use in 12-volt ac-dc alternator-generator systems which is more compact, yet equaling the performance of previous larger regulators. And of particular importance: the cost is approximately 35% less than larger models. All wearing parts of the new unit (No. R001-3505RA) are readily accessible for maximum ease of service and replacement. The regulator is physically interchangeable with Ford, Delco and Auto-Lite regulators (the latter with an adapter plate).



Other features claimed for the unit are: precise and constant voltage settings which enables accessories to operate more efficiently with longer service life; minimum arcing at contact points for longer point life, plus greater freedom from maintenance.

Because the regulator features exclusive L-N double-contact design, a battery is charged rapidly when it is low and under load. When it nears full charge, the voltage is reduced to give it a slow, tapering charge.

(Circle No. 10 on Reader Service Card)

"Stumped?"

Body Repair Kit

A complete body repair kit, designed for professional auto body men, and including at least one new plastic repair technique, is announced by Taylor & Art, Inc., Plastics.

What makes the "Old Pro Kit" new

is the inclusion of 1440 sq.in. of fiberglass cloth and one quart of WetWeld. The latter is a resin-rich liquid for use with the fiberglass cloth in the repair of large-area jobs where high structural strength is required.

According to the manufacturer, the glass cloth, when saturated with WetWeld, cures to a strip of hardness as strong as the original steel, yet flexible enough to take more impact without denting.

Also included with the kit is a quart of Flex-Bond, a plastic paste dent repair compound, plus all necessary applicators and detailed, extensively illustrated instructions.

Both Flex-Bond and WetWeld can be filed, buffed and painted, the same as the original metal.

(Circle No. 11 on Reader Service Card)

Magnus Porto-Lif

Magnus Chemical Company's latest Porto-Lif is an air-powered, mechanically agitating device that can be attached to a 55 or 30 gallon open-head drum or still tank to provide an effective air-powered parts cleaning unit. The unit operates on air pressure of from 30 to 90 p.s.i. There are no electric motors, gears or linkage to cause trouble — no introduction of air bubbles into solution to weaken cleaning strength.

A single lever controls the complete cleaning operation. A flick of the lever lowers the platform of dirty parts into the cleaning solution. Another flick of the lever agitates the parts in the solution 140 up-and-down motions per minute. A third movement of the lever raises work out of the liquid to waist high level for easy inspection and unloading.

(Circle No. 12 on Reader Service Card)

Invisible Gloves

A new type of hand protection in an aerosol package is now available from Acrolite Products, Inc.

Called Protex-A-Hand, the new hand protection is designed to keep hands clean and germ-free by forming an invisible "protective glove" to seal out grease, dirt, paints and varnishes, oil, solvents and chemicals, as well as other messy and possibly harmful materials. In addition, it cuts down on the daily washing time.

Made with lanolin and glycerine, it comes from the areosol can in foam cream form and is rubbed right into the area to be protected. Washing the hands in water is said to carry off the "protective glove" along with any accumulated grease and grime.

(Circle No. 13 on Reader Service Card)

Carburetor Clean-Out Kit

A new clean-out kit designed specifically for on-the-engine Rochester GM carburetor maintenance in connection with engine tune-ups, is now being offered by the Rochester Products Division of General Motors.

The kit contains a needle and seat assembly, pump plunger, float gauge, necessary clips, choke stat cover gasket, air horn gasket and complete instructions. A feature is a four-ounce can of newly-developed compound for cleaning exterior surfaces of the carburetor. The kit will be marketed under the name "Kleanout Kit" and will be available through GM's United Motors Service Division outlets.

(Circle No. 14 on Reader Service Card)

Tool Tips *for the Mechanic*

Ford-Mercury Gasket Holder

The *Snap-on*® GA-62 Water Pump Locator is a handy and efficient gasket holder and intake manifold locator on the Ford and Mercury. See page 78 of *Snap-on* Catalog W.

Buick Valve Lifter Service

The *Snap-on* CF-101 Piston Pin Extractor Set works fine for pulling Buick hydraulic valve lifters. See page 87 of *Snap-on* Catalog W.

NEW TOOL

***Snap-on* S-9480**
Torsion-Aire Height Gauge for Chrysler Products

With this tool you can determine if the Torsion-Aire suspension is out of level and make adjustments accordingly. Simply attach gauge to torsion assembly, set adjustable sleeve at left to manufacturer's recommended height setting. If liquid level at center shows on 0, torsion setting is correct. If gauge is off 0, tighten or loosen torsion bar to bring gauge reading to 0. Use on all Chrysler products with Torsion-Aire suspension. Ask your *Snap-on* man for full details.

Voltage Regulator Service

The *Snap-on* TMA-3 3/32" Hex Head Screwdriver and *Snap-on* Midget Handle are just the tools for adjusting 1958 Delco-Remy voltage regulators. See page 10 of *Snap-on* Catalog W.

Stop Light Switch Service

Use the *Snap-on* A-167 Ratcheting Spanner to service the new type stop light switch. Most new cars are now using a slightly off size (between 15/16" and 1") switch. Regular wrenches will not service, but the A-167 works fine. This tool is originally designed for turning speedometer cable nuts at the transmission end. See page 78 in *Snap-on* Catalog W.

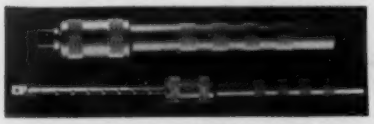
Get your copy of the new *Snap-on* Catalog W. Ask your *Snap-on* man or write direct. Watch for further Tool Tips in future issues of this publication.

SNAP-ON TOOLS CORPORATION
8035-D 28th Avenue • Kenosha, Wisconsin
(Circle No. 135 on Reader Service Card)

These are new *manufacturers' products*

Socket Wrench Extensions

The Future Tool Co. announces a new extendable socket wrench extension bar which can be quickly adjusted into the desired length to speed up service work, as well as reduce the



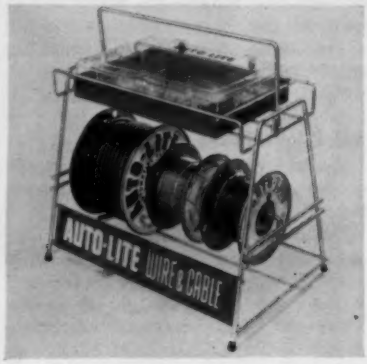
number of extension bars needed in automotive service. According to the manufacturer, it is possible for these new tools to replace up to 7 non-extendable extension bars.

Three extensions are available in ⅜" drive: #204 is a 4" extension which extends to 5½"; #207 a 7" bar extending to 11½", and #213, a 13" bar extending to 24½". There are two ½" drive extension bars.

(Circle No. 15 on Reader Service Card)

Rewiring Kit

Recently announced by The Electric Auto-Lite Co. to boost wire sales and make installations easier is an attractive, lightweight Rewiring Kit.



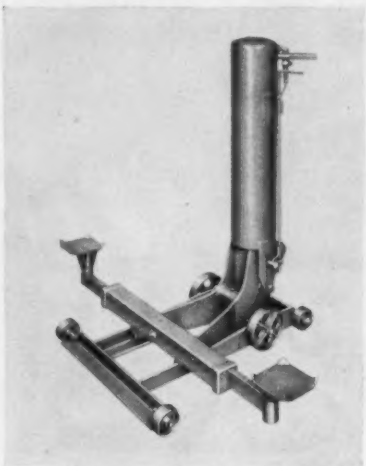
Easily portable, the kit comes with three spools of popular Auto-Lite wire and a handy tray on top for terminals and/or tools. Available with or without terminals, the kit has a special swing-out rack that makes reloading of wire spools easy. The unit measures 18" wide x 10" deep x 12" tall.

(Circle No. 16 on Reader Service Card)

Air-Operated Bumper Lift Jack

The Weaver Manufacturing Co. has announced a new Model WA-56 Air Operated Bumper Lift Jack.

Features include one hand operation —air control valve and safety lock release operated with one hand; safety



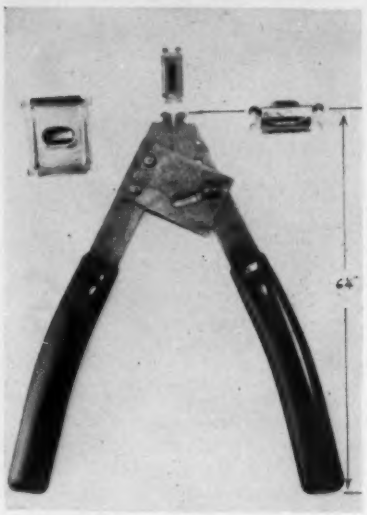
lock operates in 6 height locking positions; saddle adjustment is from minimum of 19" inside to inside to maximum of 56¾" outside to outside, and forward reach of saddles is 14½" from cylinder to front of saddles.

The jack has a lifting stroke of 24", making the saddle high point 32¼" from a low of 8¼". Capacity is 3000 lbs.

(Circle No. 17 on Reader Service Card)

Cam Action Molding Clip Tool

Steck Mfg. Co. announces a new time and temper saving hand tool designed especially for installing and staking the molding clips on late model General Motors cars. An exclu-



sively designed cam action of the "Mighty Midget" gives an extremely high leverage ratio for easy staking. The staking points are tapered from all angles and will not wedge or stick in the fastener. Because of the high quality metal used, it is said to be impossible to break the tips off in staking bulge type clips.

Vinyl plastic coatings bonded to the handles make the tool comfortable to handle. In use, the squeeze of one hand only is all that is required to bulge the ends of the fastener.

(Circle No. 18 on Reader Service Card)

Brake Cylinder Hone

A new brake cylinder surfacing hone with extra large ½" to 2¼" range to allow honing of wheel and master cylinders used on the smallest

foreign cars through heavy trucks is announced by Ammco Tools, Inc.

Special features include adjustable honing tension and flexible drive shaft. The new Model 3750 will handle blind end and step bore, as well as open end cylinders—without removal from vehicle.

(Circle No. 19 on Reader Service Card)

Easy Cure for Sticking Chokes Snowballs Service Profits

C. N. Butts

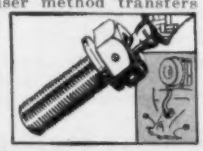
A new simple Choke Tube Repair Kit permanently overcomes sticking or inoperative chokes, a rapidly increasing complaint faced by service shops everywhere, according to reports by Clem Butts, Sales Mgr. for Houser Engineering & Mfg., Inc.

Dirt and moisture are the choke control's worst enemies. How does dirt and moisture get into the choke control? Warm air, which is essential for the proper operation of the choke is drawn through a tube located in the intake manifold exhaust by-pass, or exhaust manifold on some makes and models. Hot exhaust gases directed around this choke heater tube, warm the air as it is drawn into the choke control housing. Because of the intense heat and the corrosive action of condensation, pinholes and cracks appear in the heat tube, allowing exhaust gases and accompanying carbon to pass into the automatic choke housing.

The only remedy is a new Choke Heater Tube, requiring removal of the manifold, a time-consuming and costly job. Since all conditions causing burn-out remain the same, heater tube replacement will be needed again and again.

Low-Cost Permanent Repair Installed in 15 Minutes

With Houser's new Choke Tube Repair Kit, there is no need to remove manifold. Only one hole to drill and tap, the old burned out tube is plugged and left untouched. The Houser method transfers heat as fast as original equipment and guarantees fast, sure choke action. Won't ever burn out. Two Kits serve all Ford, GM and Chrysler Products. List Price is only $3.25 & $3.50.



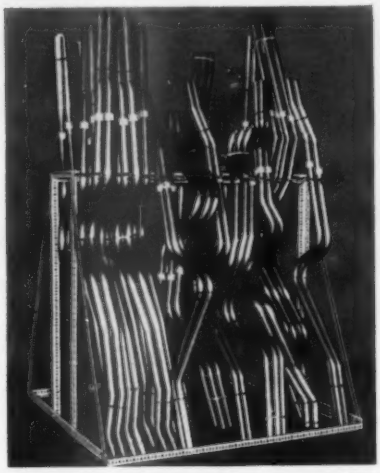
For additional information, write to Houser Engineering & Mfg., Inc., Bluffton, Ind.

Say You Saw It in
Automotive Service Digest

Tail Pipe Racks

New tail pipe racks to eliminate many of the problems involved in stocking tail pipes have been developed by the Walker Manufacturing Co.

The new racks are available in two



designs—single entry for use against walls and double entry for open areas. Both designs are available in 5 foot "starter" and 5 foot "add-on" units. Each single entry section holds approximately 75 pipes and the double entry units hold approximately 150 pipes.

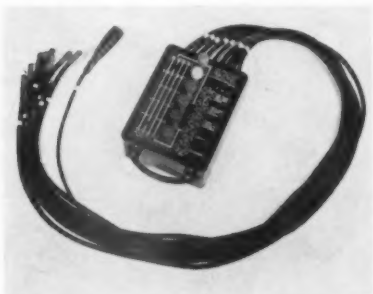
Constructed of slotted angle steel, the new racks offer stability without wall anchors and can be quickly assembled or disassembled for moving to any shop location.

(Circle No. 20 on Reader Service Card)

Cylinder Balance Tester

Kent-Moore Org., Inc. announces a Cylinder Balance Tester, designed to quickly and easily localize many difficult-to-diagnose engine malfunctions.

The manufacturer claims that with this tool, numerous engine tests, which would normally require a considerable amount of work, can be performed in



a comparatively short time. Operation and hook-up of the unit is simple: The tester leads are connected directly to the distributor and the spark plugs; and in a matter of minutes, with the aid of a vacuum gauge and tachometer, a mechanic can begin testing procedures by just pushing various buttons.

(Circle No. 21 on Reader Service Card)

New Cup-Type Spray Gun

A new, lightweight cup-type spray gun has been announced by Gray Company, Inc., which features a two-piece, aluminum alloy body with a built-in air distributor for more even air distribution and better pattern. The gun has been engineered so no gaskets are required in tip or cap assembly — eliminating chance for leaking and simplifying cleaning. All fluid tips, as well as all male threads, are stainless steel to reduce wear and give longest possible life.

The durable, one-piece, drawn aluminum paint cup has a fast-acting spider lock and cover supported yoke clamp that securely holds cup without straining lock pins.

(Circle No. 22 on Reader Service Card)

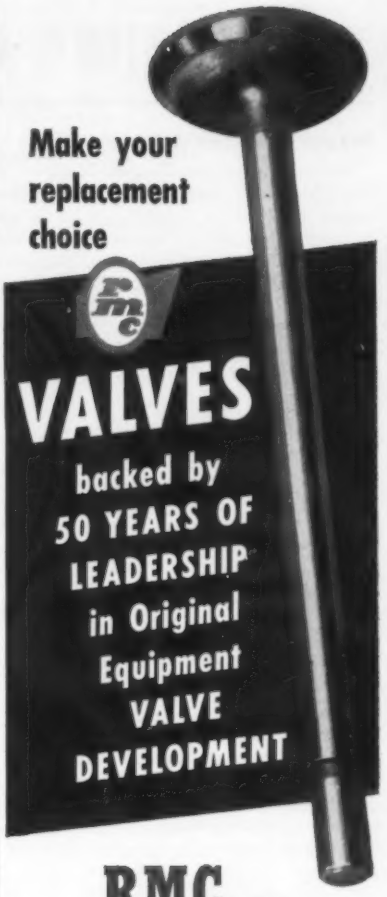
Air Conditioning Service

According to Frigikar Corp., the use of their recently acquired line of Air-Con machines will reduce air conditioning service comebacks as much as 85% and cut servicing time up to 50%.

The DeLuxe Model HV - 100 - 59

shown here is said to be so simple to use that the average mechanic can become an air conditioning specialist within a few hours. This unit not only provides precision evacuating and charging of all brands of automotive air conditioners, it also tests for leaks, creates lowest absolute vacuum pressure for dehydrating and de-gassing conditioners using Freon 12, readily measures and transfers refrigerant and oil, and holds a 145-pound Freon cylinder for maximum refrigerant purchasing economy.

(Circle No. 23 on Reader Service Card)



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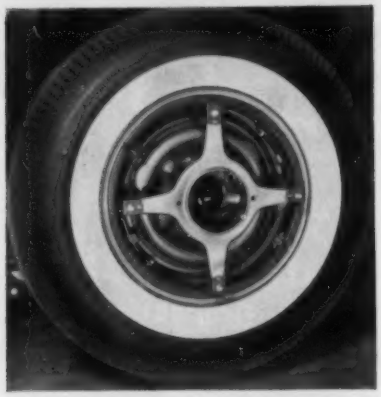
These are new *manufacturers' products*

Wheel Balancer Adaptor

According to the Hunter Engineering Co., their new Model 127, self-centering, Wheel Adaptor is the first to securely grip the *entire inner ring* perimeter of the wheel when balancing wheels on the car.



The new adaptor is instantly "locked" in operating position by simply pushing two eccentric-cam lever arms flush with the adaptor ring. Two disappearing red flags, on the lever arms, visually warn the operator when he has not locked the adaptor in position.

The adaptor will be available in four models to fit 13", 14", 15" and 16" wheels — the largest size weighing only 4½ lbs.

(Circle No. 24 on Reader Service Card)

Mobile Shop Cranes

A new ½-ton model mobile shop crane is announced by Auto Specialties Mfg. Co., which is said to be particularly handy for removing and replacing car and truck engines, since it is not necessary to remove the hood when the crane is used. Maximum height of the extended boom is 100"; minimum height 11".

Easy mobility is supplied by two fixed wheels and two ball-bearing casters; the hydraulic power unit being rated well above crane capacity figures.

(Circle No. 25 on Reader Service Card)

A.C. Arc Welders

A new line of "94 Series" instant arc A.C. welders is announced by Marquette Mfg. Co. featuring a wide 25 to 295 amps. welding range which makes the line particularly suitable for automotive shop work.

Featuring "Perma-Shield" fibreglass

construction and a super heavy-duty transformer, the welder is ideal for use on all types of welding work from the lightest sheet metals to heavy steel plate. High open circuit voltage for faster arc striking and easy handling of even very "difficult" welding electrodes is another ideal feature. Lifetime sealed-in-oil blower motor keeps all vital parts cool and clean, even under heavy or continuous loads.

(Circle No. 26 on Reader Service Card)

Steam Cleaner Hose

A distinctive green colored hose, designed and built for use with all steam cleaners, is announced by Malsbary Mfg. Co. The hose is reinforced by high tensile, stranded steel wire and braided rayon yarn, for steam cleaner solutions up to 325°F. The makers claim the inner tube is heat, swell and alkaline resistant; and the cover highly resistant to weather, oil alkali and abrasion.

The hose has ½" inside diameter and comes in 25 to 50 foot lengths, coupled or uncoupled, and is packaged in attractive boxes to facilitate shelving and handling.

(Circle No. 27 on Reader Service Card)

Vapor Degreaser

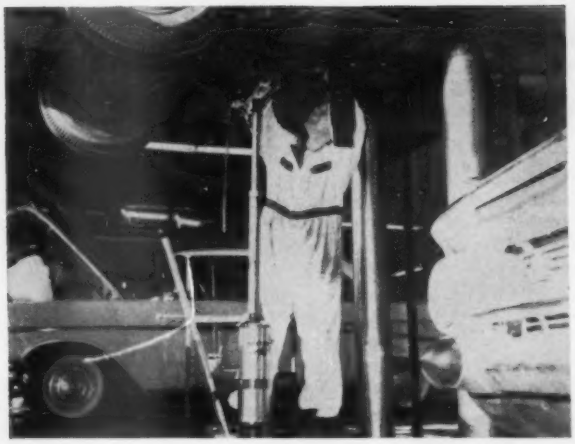
Phillips Manufacturing Co. announces a new lightweight and portable "Scotsman" model vapor degreaser which will clean up to 300 pounds of steel per hour. It is all

electric and requires no installation; connects to any 220-V outlet for instantaneous use.

Incorporated in the design is a heavy duty vapor control and high temperature shut-off to eliminate fire hazard. The immersion type heater is removable for easy clean-out. The zinc coated steel tank has a solvent capacity of six gallons and is attractively painted on the outside.

(Circle No. 28 on Reader Service Card)

"Any of you guys handle foreign jobs?"



Removing automatic transmissions with a minimum of time and labor

Transferring an automatic transmission from car to work bench with little chance of damage or injury, is accomplished neatly by a method worked out at a Des Plaines, Ill., Chevrolet dealership: Des Plaines Motor Sales. It does away with manual lifting, which can result in injury to shopmen; also reduces the possibility of dropping the transmission, with serious results.

As the transmission is detached from the engine and frame, it is supported by a high lift hydraulic jack (as in illustration above). Once entirely loosened, it is brought down to the jack's lowest position, to minimize danger of tipping and dropping, then moved into position just under the rear bumper of the car. (Both the jack and the transmission bench are on casters, and can be easily rolled wherever desired.)

Next, a chain with a hook at the top and a double hook at the bottom is attached to two screws on the flange of the transmission, in such a way that the weight of the unit is balanced. The car is lowered on the lift, to a point that permits the top hook on the chain to be hooked over the rear bumper.

By raising the car on the hoist, the transmission is lifted off the jack, and held in the air, supported by the chain attached to the bumper. The work bench is then rolled into position; the hoist lowered again, until the transmission is in place on the bench fixture (as in cut below). Bolted to the fixture, the unit can be rolled safely away to a convenient work area.

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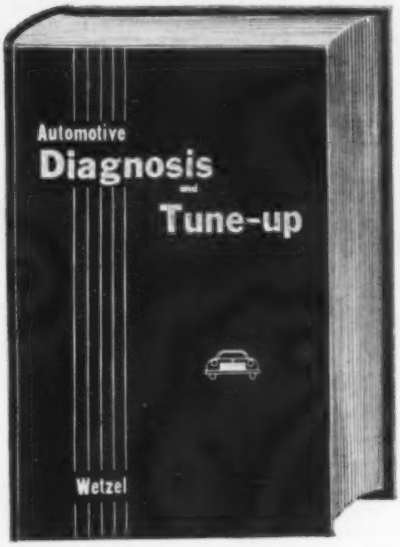

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SEE MORE PERMATEX PRODUCTS FEATURED ON PAGE ONE

Literature:

manuals, catalogs and charts

most items are yours for the asking

EXHAUST SYSTEM SELECTOR . . . developed by Maremont Muffler Div. provides easy visual identification of virtually all types of exhaust systems and their component parts for most makes, years, and models of passenger cars. For clarity, the complicated details of the many bends and variations found in today's exhaust systems have been eliminated, leaving only the essential parts in clear and simple outline. A listing of muffler installation tools, and a step-by-step series of diagrams on effective muffler installation completes the Selector.
(Circle No. 29 on Reader Service Card)

CAR LIFT WALL CHART . . . contains easy-to-read instructions for lifting 1959 cars. Prepared by Walker Mfg. Co. engineers, the chart provides a fast reference for all one-end lift operators. Large front and rear photos of 1959 cars and simple diagrams enable shop operator to determine lifting positions at a glance.
(Circle No. 30 on Reader Service Card)

LEAF-SPRING CATALOG . . . To make it easier for shopmen to order leaf-springs, Trainor National Spring Co. is offering, free, a new, condensed, 8-page catalog listing and giving pertinent information regarding leaf springs for all popular models of cars and trucks from 1950 through 1959.
(Circle No. 31 on Reader Service Card)

FRONT END SERVICE . . . The complete line of John Bean Division wheel aligning and wheel balancing accessories and supplies, tools for late model cars and a new rear wheel chock designed especially for aligner operators working in pits, is listed in the company's revised catalog L-1615. Other equipment cataloged in the 12-page offering covers passenger car and truck wheel balancing weights, a variety of caster shims, camber tool sets, toe-in gauges, wheel spreaders and a wide assortment of additional correction and installation tools.
(Circle No. 32 on Reader Service Card)

HAND TOOLS . . . A miniature, pocket size catalog (Mini-Cat No. 10) is announced by The Vlchek Tool Co. which contains illustrations and detailed specifications on their alloy steel and drop-forged carbon steel wrenches and sets of open end, box and combination types, socket wrenches and attachments, adjustable wrenches, pliers, screwdrivers, chisels, punches, metal shears and snips, hammers, mallets, etc. Also listed are the company's plastic hose nozzles, storage and display boxes and utility boxes.
(Circle No. 33 on Reader Service Card)

TESTING EQUIPMENT . . . 16-page quick-reference catalog presents the complete line of automotive testing equipment available from Auto-Test, Inc. Many of the items show illustrations in use as well as supplying equipment specifications and applications.
(Circle No. 34 on Reader Service Card)

FUEL AND ELECTRICAL SYSTEMS . . . The 1959 AEA Electrical and Fuel Systems Catalog provides a ready reference covering all popular fast-moving parts for distributors, generators, starting motors, carburetors, fuel pumps, fuel gauges and fuel lines for all passenger cars and light trucks. A special feature in this year's catalog is the inclusion of some foreign cars.

All units and parts shown are original equipment for the vehicle listed. Also included is an illustration section to help identify the various parts listed, as well as a complete price list of all parts listed.
(Circle No. 35 on Reader Service Card)

IMPORT CAR REPLACEMENTS . . . Twenty-four page *Moog Foreign Car Catalog* for 1959 lists steering and suspension parts for the popular imports. Indexes 54 cars. Presents data alphabetically by car, and numerically by part number. Covers tie rod ends, drag links, side tube assemblies, king bolt kits, ball joints and suspension repair kits, shock absorbers. Copies free on request.
(Circle No. 36 on Reader Service Card)

AIR COMPRESSORS . . . Bulletin A-110 gives complete specifications on Lincoln Engineering Company's new line of reciprocating type air compressors . . . over 200 models with motor or engine capacities from ¼ hp. to 20 hp., air displacement up to 92 c.f.m., and tank capacities up to 200 gal. . . . both horizontal and vertical mounted tank models.
(Circle No. 37 on Reader Service Card)

CARBIDE GRINDING . . . Just off the press is a new Carborundum Co. brochure on diamond wheels (both natural and man-made diamonds) for carbide grinding. Deals with bond types, infeed and table speeds, wet grinding, diamond concentration, types of wheels. Also lists recommendations on the six most common applications.
(Circle No. 38 on Reader Service Card)

FILTER DATA . . . Listings and information on 32 new Fram filter cartridges for oil, air and fuel requirements for 1959 G. M. cars as well as replacements for other makes of cars, trucks, busses, tractors, industrial and marine engines and power lawn mowers.
(Circle No. 39 on Reader Service Card)

PAINT SPRAY EQUIPMENT . . . Catalog A-53, being offered by The DeVilbiss Co., covers recently introduced and improved spray equipment. Included is complete information on 15 different models of spray guns, air compressors, air regulating equipment, paint cups and tanks, spray booths, exhaust fans, hose and connections, infra-red drying equipment, hot spray units, respirators and underbody coating equipment. Also listed is a variety of complete outfits, each made up of selected components best suited for the type of job or capacity required for efficient spray painting.
(Circle No. 40 on Reader Service Card)

HAND TOOLS . . . A new, illustrated 48-page catalog being offered by Kennedy Service Tools Co. shows the company's complete line of precision crafted tire tools as well as tune-up equipment, hand tools, taps and dies, and many other allied items.
(Circle No. 41 on Reader Service Card)

You may want this information, and most of it comes to you free. Just circle the key number on the Reader Service Card corresponding to the one that appears with the editorial review. Our Reader Service Department will forward your inquiry to the manufacturer or supplier for attention.

MUFFLER GUIDE . . . Walker Mfg. Co's. 1959 Muffler Installation Guide includes photos and easy-to-read instructions for removing and replacing mufflers. Special suggestions and short cuts are given for particular car makes and models to provide a thorough guide for all types of installations.

(Circle No. 42 on Reader Service Card)

GAS REGULATORS . . . A new 36-page catalog (ADC-705F) covering Air Reduction's complete line of cylinder, manifold and station pressure regulators is being offered by Air Reduction Sales Co. which contains flow and pressure specifications, as well as inlet and outlet connection dimensions, for each regulator. Adapters, station valves, flowmeters, hose connections and pressure gauges are also described in detail.

(Circle No. 43 on Reader Service Card)

MERCHANDISER MANUAL . . . Guaranteed Parts Co., Inc., has a new 16-page, illustrated manual of its new line of merchandising units for ignition parts, which are supplied free when the company's full stock of contents is purchased. The manual also outlines the company's line of ignition parts and marketing displays.

(Circle No. 44 on Reader Service Card)

LAMP AND FLASHER SPECS . . . Tung-Sol's 1959 Lamp and Flasher Service Guide includes lamp and flasher specs for domestic and foreign cars, trucks and buses from 1946 through 1959. The guide has been expanded this year to include aiming, installation and replacement specs for the new 6000 series spotlight low beam Vision-Aid headlamps and the new 4000 series dual Vision-Aid headlamps. Step-indexed for ready reference, the new guide also contains miniature lamp replacement charts, new heavy-duty flasher replacement and installation charts, tips on voltage variation and other useful information.

(Circle No. 45 on Reader Service Card)

GLASS SPECIFICATIONS . . . Complete glass specifications for all American cars and trucks and most foreign automobiles, are contained in the new 112-page 1959 Shat-R-Proof Auto Glass Parts Catalog. In addition to glass specs and pattern numbers, the catalog features an interchangeable parts section, a foreign glass parts section, a safety glass area calculator, and a brief informative review of the three types of automobile glazing materials.

(Circle No. 46 on Reader Service Card)

HAND TOOLS . . . A complete general catalog of specialized automotive hand tools is now available free from the K-D Mfg. Co. Containing more than 130 listings, the book is profusely illustrated, with operating procedures on all tools clearly explained.

(Circle No. 47 on Reader Service Card)

WHEN CHANGING YOUR ADDRESS

Please notify us 5 weeks in advance. Supply us with both your old and new address, including address label from current issue if possible. Copies we mail to your old address will not be delivered by the Post Office unless you pay them extra postage. **Mail address changes to Circulation Dept., Automotive Service Digest, 900 South Wabash Ave., Chicago 5, Ill.**

Changing Dodge Main Metering Rod Overcomes Surging at Cruising Speed

If a surging condition is encountered at cruising speeds with a 4-barrel equipped, 1959 Dodge, the factory recommends replacing the standard metering rods (Carter Part No. 16-45) with Carter Part No. 16-70 rods.

To replace the rods, first remove the carburetor air cleaner. With the air cleaner removed, the bolts holding the metering rod vacuum piston spring retainer can be removed, allowing removal of the pistons and rods. When replacing the rods, make sure that the rods have entered the main jets before compressing the piston spring and replacing the retainer plates.

Calendar of Automotive Events

1959

May 3-8—Top Management Institute, Motor and Equipment Wholesalers Assn., Allerton House, University of Illinois, Monticello, Ill.

May 17-19—6th Annual Convention of The Automotive Wholesalers Assoc. of Tennessee, "Castle in the Clouds" Hotel, Chattanooga, Tenn.

May 17-20—Automotive Engine Rebuilders 37th Annual Convention, Royal York Hotel, Toronto, Ontario, Can.

June 24-27—Independent Garage Owners of America, Inc. (IGOA) National Convention, Albany Hotel, Denver, Colo.

Oct. 28-30—Automotive Parts Rebuilders Assn., 12th Annual Convention, Hotel Roosevelt, New Orleans, La.

Nov. 2-5—Automotive Warehouse Distributors Assn., Annual Convention and Manufacturers'-Distributors' Conference, Muehlebach Hotel, Kansas City, Mo.

NEW! INLAND 1-Piece RADIATOR SHOP

Now—**a complete radiator shop** ...easy to test, clean and repair radiators. Only 11′ 7″ long... handles all car radiators, many truck and tractor radiators.

FREE FACTORY SCHOOL will train one of your men...and in only a part of his time he will produce nice additional profits. Many adding $8,000-$15,000 a year servicing radiators.

FREE 48-pg. book, all about Inland Radiator Shop, easy-pay plan, letters from shop owners.

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1108 Jackson St. Omaha 2, Nebr.

WRITE INLAND MFG. CO., Dept. AD-4, 1108 Jackson St., Omaha 2, Nebr. Please send free 48-pg. book describing new 1-Piece Radiator Shop, training school, prices, etc.

FIRM _____ PLEASE PRINT

ADDRESS _____

CITY _____ ZONE _____ State _____

BY _____ TITLE _____

If dealer, make of car sold _____

Are you now operating a radiator Dept.? ☐ Yes ☐ No

Flushing Torque Converter Prevents Later Failure

In the event that an automatic transmission fails, and the oil has become contaminated, the Plymouth Service Department states it will be necessary to flush the torque converter to insure that fine metallic particles are not later transferred into the transmission valves and oil circuits.

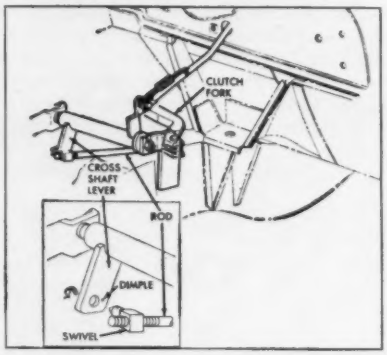
Before this can be accomplished, it will be necessary to turn the torque converter stator hub, so that one of the ⅛" x ⅜" rectangular slots is visible at the top. This may be accomplished by using a screwdriver and by moving the stator hub (the large splined hub) in a counter-clockwise direction.

Since there is a second slot directly below, an adequate opening is provided for the kerosene (if poured slowly). After the kerosene is in the torque converter, seal the hub opening with masking tape. Rotate the converter for approximately ten seconds by cranking the engine. Note: *Disconnect the coil wire to prevent the engine from starting.* Drain the converter by removing the drain plug and the masking tape.

Repeat this procedure until the flushing kerosene drains out clear. To complete the flushing procedure, rotate the converter with the drain plug removed. This will remove any residual solvent and trapped foreign material. Reinstall the drain plug, reassemble, and refill with the recommended lubricant.

Adjusting Chevrolet Clutch Pedal Free Travel

Experience with adjusting clutch pedal free travel on 1958-'59 Chevrolet passenger cars has shown that it is very difficult to determine when the release bearing actually contacts the clutch spring by "feeling" ¾" to 1" lash at the pedal. As a result, this is resulting in an incorrect setting.



Chevrolet recommends that mechanics utilize the locating dimple in the clutch cross shaft (see sketch); which will automatically provide the desired (.060" design) clearance between the bearing and clutch spring, when linkage is assembled as described below:

1. Disconnect the forward end of the clutch fork push rod from the cross shaft lever.
2. Press the fork push rod rearward to remove all lash.
3. Adjust the swivel on the push rod so that the conical point of the swivel lines up with the "dimple" in the cross shaft lever.
4. Hold swivel position on rod and reconnect swivel to cross shaft lever.

Rough Idle on Air-Conditioned Cars

Complaints of rough engine idle on 1958-'59 Mercurys equipped with air conditioning have been found attributable to low idle speed. With the engine at normal operating temperature, the transmission selector in "DR" position and the air conditioning turned on, so that the compressor is engaged and operating, adjust the mixture and set idle speed at 450 to 475 r.p.m. This procedure is said to compensate for the drop in engine r.p.m. when the air conditioning compressor is activated.

a new line-up
of Herbrand
"HEX-FIT"
COMBINATION WRENCHES
THEY FIT THE HEX!
1. CONTOUR-SHAPED HEAD FITS IN CLOSE QUARTERS.
COMPLETE RANGE OF POPULAR SIZES ACTUALLY REQUESTED BECAUSE OF THESE FEATURES!
OBSOLETES ALL OTHER WRENCHES
2. BOX END FORGED ON 15° ANGLE—NOT BENT!
3. ADDED LENGTH... AND RAPIER-THIN FOR EASIER HANDLING, BETTER BALANCE.
Now, Hex-Fit combination wrenches are available in a complete range of matched sets of popular sizes, from 3/8" to 1-1/4" in 12-point openings—and from 3/8" to 3/4" in 6-point openings.
In its jewel-rich hand polished finish, contour-shaped ends—every feature of design—the new Hex-Fit series reflects Herbrand's 70 years of accepted leadership in producing job-matched tools for the professional mechanic. See them and you'll agree! Write for new Hex-Fit folder, covering complete range of sets and sizes.
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Ask your jobber.
HERBRAND DIVISION
THE BINGHAM-HERBRAND CORPORATION • FREMONT, OHIO

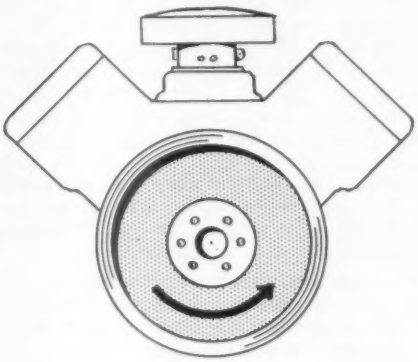
BRUSHING UP ON THOSE
EASY-TO-FORGET THINGS

Refresher course

✔ *Potential and Kinetic energy*

• THE ENERGY WHICH a body has due to its position or state of strain is termed potential energy. For instance, the energy of a raised pile driver hammer is potential.

Likewise, the energy of hot compressed gas in an engine cylinder just after ignition is potential energy. Or, when a clock spring is wound up, it drives the clock as it uncoils because of the elastic strain within it due to its change in shape.



Motion such as that in a flywheel is the essential fact in a body having kinetic energy.

When the pile driver hammer drops it progressively loses its potential energy but acquires more and more of another kind of energy as its speed increases. As the hammer strikes, all potential energy has been changed into energy of motion called kinetic energy. The kinetic energy of the moving hammer as it strikes the pile is equal to the potential energy of the raised hammer.

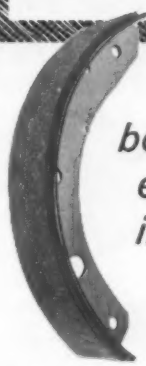
Every body in motion such as an automobile, a flywheel, a pitched baseball and so on, has kinetic energy. It will do a certain amount of work against a resisting force before it stops moving. Motion is the essential fact in a body possessing kinetic energy.

Should a ball be thrown vertically upward it gradually loses its motion and its kinetic energy. When it reaches its highest point, its energy is all potential. Upon descending it again acquires energy of motion. The one form of energy is therefore convertible into the other.

"Boy! My stops are much faster and smoother since I lined with NATIONAL!"

...USE BRAKE SHOES BONDED WITH PURR-FECT

FRICTION CONTROLLED
NATIONAL
Brake Block



skillfully bonded by an experienced independent bonder in your area!

Friction controlled for longer service, NATIONAL'S dense, brass chip-impregnated composition assures quick acting safe braking – even under conditions of extreme heat. In any weather you can rely on NATIONAL for soft, sure stops.

Jobbers, write now for our profitable exchange program

NATIONAL
BRAKE BLOCK COMPANY
Since 1919
37-17 57th Street, Woodside 77, N. Y.

Bearings . . . *(Continued from page 19)*

to replace both inner and outer bearing assemblies, even if only one fails. The conditions that caused the failure of the bearing were present and working on both bearings. Therefore, it's safe to assume that bearings fail in pairs—when pairs are used on single wheel applications.

Oil seals, whenever removed, are automatically replaced with new seals. Precision seals are designed to fit their bores with a tight press fit. Seal removal—even with special pullers usually damages the seal's ability to make a perfectly leak tight connection.

Never install a replacement seal dry. Either dip it in clean engine oil, or coat the sealing lip with clean, light grease before forcing the seal in its bore. This light lubrication reduces harmful friction during installation and during the break-in period. It also enables the seal to become immediately effective.

Drivers should be used to install replacement seals. The driver must be of the right size and properly used. An incorrect driver, or sloppy workmanship can cause the seal to cock in its bore, damaging the seal and causing bearing failure. To be effective, seals always must be properly installed.

Bearing cups also require careful installation. It's best to use an arbor press to force the cups in their bores. Lacking a press, satisfactory installations can be made by carefully using the old cup as a driver. When using this method, tap the seal lightly to avoid cracking the case hardened surfaces.

ADJUSTMENT

The effectivness of all the foregoing operations hinges heavily upon properly establishing internal running clearances. This step is most commonly called the bearing adjustment.

Several methods are provided for correctly establishing and permanently maintaining wheel bearing adjustment. The most universally adapted method for passenger car application employs a drilled spindle, flat washer, castellated nut, and cotter pin. The flat washer rides against the outer wheel bearing. The nut is run on the spindle threads and bears against the washer. When the exact tension is applied by the nut, the cotter pin is inserted through the drilled passage in the spindle to lock the nut in position.

Spindles designed for ball bearing application are usually cross-drilled. That is, they have both a vertical passage and a horizontal passage drilled for the cotter pin. Cross-drilling provides an added degree of accuracy for ball bearing adjustment. Roller bearings aren't quite so critical from an adjustment standpoint, so spindles designed for roller bearing application are ordinarily drilled in one plane only.

There are other locking devices available. Jam nuts are sometimes used as are serrated locknuts. Regardless of what is used for a locking device, adjustable front wheel bearings must first be set to the proper running clearances. Once correctly set, any locking device will prove satisfactory.

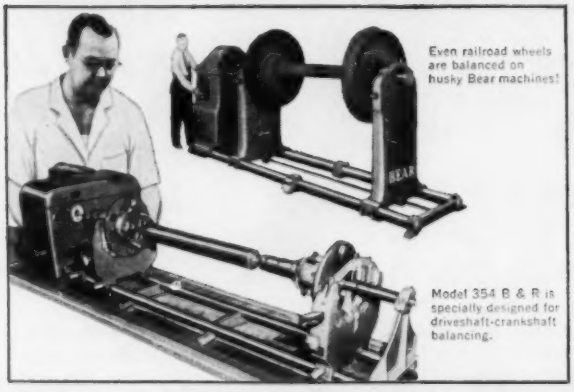
Modern wheel bearings *must* be adjusted with a torque wrench. There is no other way to accurately determine —and establish—correct adjustment. Manufacturer's specifications vary, but there is one universal rule that fits pretty much across-the-board. That is: Torque roller bearings to 50 ft. lbs. Torque ball bearings to 33 ft. lbs. *Always rotate the wheel while torquing.*

The purpose of torquing is to make sure direct contact exists between the bearings and their raceways before the specified running clearance is established. After torquing, back off the nut until the closest slot in the nut lines up with a hole in the spindle. Then install the cotter pin. Before bending over the cotter pin, rotate the wheel to test for excessive brake lining or oil seal drag. If the wheel rolls freely, bend over the cotter pin to securely lock the adjustment nut in position. Then, install the dust cap. Never back off the adjusting nut more than one-sixth of a turn (one hex), and never torque the nut beyond specified torque for the type bearing. Overtorquing can cause serious brinelling, even on a new bearing.

Proper bearing selection, proper lubrication, correct installation, and accurate adjustment are the keystones of professional bearing service as performed by modern, highly skilled automotive technicians.

* **Illustrations courtesy Federal Mogul Co., Detroit, Mich.**

THE "BIG MONEY" BETS ON BEAR...


Even railroad wheels are balanced on husky Bear machines!
Model 354 B & R is specially designed for driveshaft-crankshaft balancing.

TO BALANCE DRIVESHAFTS. CLUTCHES. CRANKSHAFTS

Reason: Bear brings all the extra profit-making advantages in speed, precision and performance of the industry's most experienced producer of balancing machines. No wonder you'll see Bear in leading jobber, engine rebuilder and fleet shops everywhere—and among the biggest names in U.S. Industry! Write for free catalog.

BEAR BEAR MFG. CO., Dept. A-4, Rock Island, Illinois

...the world's most complete line of balancing machines

Safety Check Plan Concentrates on U-Joints

With an estimated one out of every three vehicles on the road today in need of universal joint service, for safety's sake, Neapco Products, Inc., announces a new Safety Check Plan to enable service shops to cash in on this vital service.

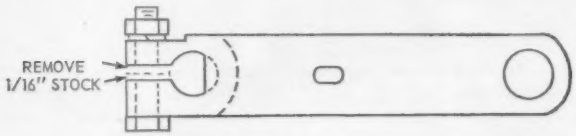
Checking for U-joint trouble is a natural grease rack job, taking only a minute. Replacement, if found necessary, takes about an hour, with no special tools required.

In order for service shops to capitalize on these extra profits, Neapco is offering a fast moving basic stock package of only eight items which will service 90% of the cars on the road.

To identify shops offering this Safety Check service, a bright 3-color metal sign is furnished free with the initial order of basic stock.

Loose Accelerator Shaft Lever Causes Erratic Operation

Should you experience a harsh, delayed, or erratic shift operation in a Torque-Flite Transmission on early production 1959 Chrysler and Imperial models, the factory states that it may be caused by a loose accelerator



shaft lever, located at the engine cross-shaft bracket on the engine side of the body dash panel.

To correct this condition inspect the lever fit on the cross-shaft and torque tighten the clamp bolt to 10-12 ft.lbs. If the lever is still loose on the cross-shaft, remove the lever.

Rework the lever by removing approximately 1/16" stock from each side of the slotted end with a hacksaw or file to provide an additional ⅛" clamping distance, as shown in the sketch, after which the lever should be installed and the transmission and accelerator linkage adjusted according to factory procedure.

The "eyes" have it for accuracy

From the Automotive Engine Rebuilders Ass'n, we learn that an independent engine rebuilder who does practically all tailored jobs follows a procedure that prevents confusion, as well as bickering with the customers; and makes a permanent record of all his rebuilt engines. His procedure is as follows:

When the old unit arrives at his plant, before dismantling it, he takes a picture from the front, the rear, and the two sides of the engine with a Polaroid Camera, which develops the film in 60 seconds. He also has a supply of square metal tabs, approximately one inch, to which he stencils a serial number that is allotted to the particular engine. Each unit that is removed from the engine such as the carburetor, starter, generator, governor, or any other assembly is tabbed so that it will not get lost, and then eventually, returned to the finished job.

He states that there are occasions when the owner comes back with a protest that all the units were not returned with the overhauled job. With proof of photographs that he has filed on the job, the rebuilder produces the evidence which is a check against errors by his personnel, or which tells the story if the unit was not with the job when it was brought in.

He also states that the photographs are a big aid in cutting down the time element of assembly, for the reason that the mechanic can refer to the photographs showing the position of the unit in cases where there is a possibility of mounting it in different places because of the design of the engine. This rebuilder advises that it is worth the effort to follow through in this detail to keep the good will of the customer as well as good records for himself.

WHEN CHANGING YOUR ADDRESS

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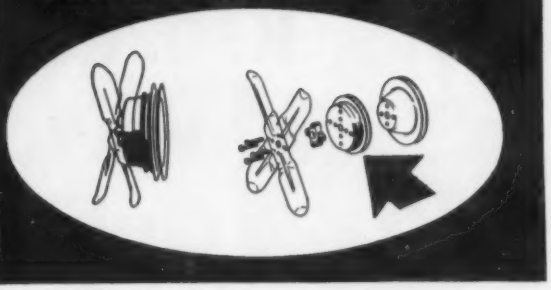
NEW BPS AUXILIARY PULLEY



PROVIDES POWER TAKE-OFF FROM THE CAR ENGINE

This efficient pulley fits over the original pulley (WITHOUT DRILLING OR MACHINE WORK). The simple power solution for: Ham radio generators, 110 v AC generators, air compressors, pumps, sirens . . .

APPLICATIONS:

Chevrolet 55-59; Ford, Lincoln, Edsel, Mercury 55-59; GMC ½ and ¾ ton trucks 55-59; Buick 51-59; Pontiac 55-59; Plymouth and Dodge 57; DeSoto and Chrysler 57-58; Nash Rambler Model 01 58-59.

$5.95 LIST

Here is a sure-profit item for all automotive service and parts departments! Built by the manufacturer of BPS CHOKE-STOVE.

Check with your jobber

BRAKE PARTS SPECIALTY

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FOR *Quality, Service, Profits*

USE MILEYBOND BRAKE SHOES

LINED WITH MILEY "BLACK GOLD"

The quality lining—cured by the bonding process itself to prevent overbaking, brittleness, crumbling and squeaking—gives a tighter, safer fit. Miley is the only brake lining manufacturer who also makes its own steel shoes—made to original equipment specifications.

Try Miley Service . . . for quick shipment anywhere. Jobbers in all principal cities.

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Factories at Chicago and North Manchester, Indiana

SEAL LEAKS! STOP RUST!

DOUBLE ACTION RADIATOR CEMENT

. . . MADE FOR THE PROFESSIONAL!

This famous product works twice as hard . . . sealing leaks AND preventing rust. Fast! An enemy to leaks and rust, BUT won't hurt copper, bronze, brass, aluminum, rubber.

SEE MORE PERMATEX PRODUCTS FEATURED ON PAGE ONE

The New
K. O. Lee
Valve
Guide
Reaming Sets

Designed to service late model engines which have valve guides cast as part of the cylinder head. In this new type head, it is the valve which has to be replaced. This is accomplished by reaming out the valve guide for oversize stem valves. Most of the engine and valve manufacturers now offer at least three sizes of oversize valves.

The Lee Reamer Guide provides a true alignment with original guide bore using Lee Self-expanding pilots. The reamer is held rigid with reaming bushing during reaming operation. Simple to operate and extremely accurate.

Special sets available to service Ford, Mercury, Lincoln, Chevrolet, Plymouth, Dodge, DeSoto, Chrysler.

R55 Reseater Power Drive adapts to these valve guide reaming sets.

Clip ad to your letterhead and send for Literature.

K. O. Lee Company, Aberdeen, S. D.

GRIND
CRANKSHAFTS
✓ IN THE BLOCK
✓ IN THE LATHE
✓ IN THE STAND
The Winona Crankshaft Grinder has been giving fast, accurate service for over 20 years. It will grind crankpins from 1" to 3½" in diameter in the block! Or, with the crankshaft in your lathe it will grind crankpins and main bearings. A Grinding Stand may be used instead of a lathe. It enables you to control your price, profit and delivery. Write today for prices and literature.
WINONA TOOL MFG. CO.
WINONA, MINN. U.S.A.

Refinishing Pitfalls . . .

(*Continued from page 60*)

when enamel is applied over inadequately cured enamel. The application and reduction have much to do with this condition. Lifting may sometimes be avoided if the coat carrying the strong solvent is applied in very thin coats or mist coats, with time for drying allowed between coats.

The remedy for lifting is to remove the affected area and respray.

FISH EYES

Silicone waxes, polishes and resins which are so widely used have brought about the need for more effective cleaning of any paint surface before another coat of paint is applied. When paint is applied over surfaces containing silicones the usual effect is crawling of the paint, improper wetting of the surface, craters or fish eyes, poor flow-out and poor adhesion. The tiniest amount of silicone can cause difficulties.

The remedy is to do a thorough job of cleaning the metal or old paint before sanding, with a silicone removing compound. Silicone materials are very persistent and it takes considerable care plus the proper cleaning materials to remove them effectively. The cleaning procedure is to wash off the area to be refinished with clean rags saturated with a good silicone solvent and cleaning solution. After the area has been thoroughly gone over, switch to clean rags and wipe off the excessive silicone cleaner. Follow this with dry sanding or water sanding, preferably water sanding, because it will lay any dust that might carry silicones to other jobs and make them unfit for repainting. After the sanding operation, wash with water, rub or blow off; and again with clean rags, wash the entire area to be repainted with the silicone solvent. Then with dry clean rags remove all traces of the silicone solvent.

Rags which have been used in removing silicone bearing materials should not be used again for any phase of a painting operation, as this will only cause further contamination and add to the difficulties of painting the job.

Lacquer primer-surfacer applied to a surface containing silicones will be retarded in its drying and cause it to roll up under the sandpaper when sanded. There are additives available which, when added to the paint before applying it, will eliminate the effect of silicones and avoid fish eyes. But thorough and careful cleaning is still highly advisable.

BRUISES AND CHIPPING

Stones thrown up by other cars on the road, careless handling, etc., will chip finishes that are hard and brittle. The newer finishes are much tougher than the older materials and therefore chipping and bruising are much less common. The new materials remain tough and elastic over a long period of time and are quite resistant to chipping or bruises. If there is an objectionable amount of chipping, the only remedy is to sand out and refinish.

* *Photographs courtesy the Ditzler Color Div., Pittsburgh Plate Glass Co.*

Powerful Lot of Car Comfort

An all-time high 1,000,000 electric automotive motors were produced and shipped in December 1958, Delco Appliance Division of General Motors Corporation announced. According to the firm, the production achievement reflects the American motorist's appreciation of the comfort and safety benefits of cars equipped with electric power assists.

Say You Saw It In Automotive Service Digest

Grips the screw!
Drives it too!
Quick-Wedge
SCREW-HOLDING
SCREWDRIVER
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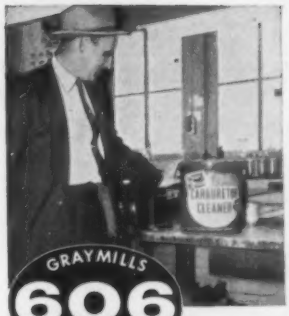

"I LIKE 606 BECAUSE . . .

it has no odor and does the best job of cleaning of any cleaner I have ever used. Does not injure hands and is economical to use."

Signed testimonial from Marvin E. Wallace, Service Mgr. and P.A., Anderson Motor Co., Xenia, Ohio.

67

leaves no odor—cleans faster.

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HE WHO LAUGHS, COME WHAT MAY,

WILL LIVE TO LAUGH ANOTHER DAY

Short circuit smiles

If you agree that our children are watching too much television, you'll like this one about the young lad who rushed home from kindergarten and insisted his mother buy him a set of pistols, complete with holsters and gun belt.

"Why, whatever for, dear?" mother asked. "You're not going to tell me that you need them for school?"

"Yes, I do," he asserted. "The teacher said that tomorrow she's going to teach us to draw."

★ ★ ★

Highbrow: Person who doesn't think of the Lone Ranger when he hears the William Tell.

★ ★ ★

The pretty young teacher was explaining the difference between abstract and concrete.

"Concrete means something you can see," she told the children, "and abstract something you can't. Now who will give me an illustration?"

Little Tommy in the first row was the first to hold up his hand. "My pants are concrete," he said. "Yours are abstract."

★ ★ ★

A woman, entertaining a friend's small son, asked, after watching his struggle: "Are you sure you can cut your meat?"

"O, yes," he replied, "we often have it as tough as this at home."

★ ★ ★

A man rushed into a bar and asked the bartender if he had something to cure hiccoughs. The bartender slapped the man across the face with a wet bar rag, and said, "Now you don't have hiccoughs, do you?" The furious fellow shouted, "It's not me, it's my wife, who is sitting out in the car."

The stranger walked up to a Las Vegas dice table and laid down a $1000 bet. He shook the dice, but as he threw them a third cube fell unexpectedly from his sleeve. The house operator was unruffled. He handed back two of the dice and pocketed the third, saying, "OK, roll again. Your point is 15."

★ ★ ★

Parents spend the first part of a child's life getting him to walk and talk . . . the rest of his childhood is spent in getting him to sit down and shut up.

★ ★ ★

Little girl watching her aunt getting dressed: "Humph!" she bragged, "my mommy's got bigger ones in her dresser drawer."

★ ★ ★

"Listen," said one cute thing to another concerning a rival, "all a sweater does for her is to make her itch."

"Ol' Hank sounded mad enough to eat your head off for ruining that motor!"

A doctor was fuming when he finally reached his table at a banquet, after breaking away from a woman who sought advice on a personal health problem.

"Do you think I should send her a bill?" he asked a lawyer who was sitting next to him.

"Why not?" the lawyer replied. "You rendered professional services by giving advice."

"Thanks," the physician said. "I think I'll do that."

When the doctor went to his office the next day to send a bill to the annoying woman, he found a letter from the lawyer. It read: "For legal services . . . $25."

★ ★ ★

Husband: "I bought something today for the one I love best. Guess what."

Wife: "A box of cigars."

★ ★ ★

A floorwalker, tired of his job, gave it up and joined the police force. Several months later a friend asked him how he liked being a policeman. "Well," he replied, "the pay and the hours are good, but what I like most is that the customer is always wrong."

★ ★ ★

A young mother had just returned from the hospital. The doctor advised her to rest often.

While resting on the davenport her five-year-old son was given the job of answering the bell.

One afternoon there was a florist deliveryman with a large container of flowers. Imagine the mother's surprise when she heard her son say:

"Take them back. She isn't dead yet."

★ ★ ★

Husband: "The iceman's been bragging that he's kissed every woman in the apartment house except one."

Wife: "That must be that snooty Mrs. Brown upstairs."

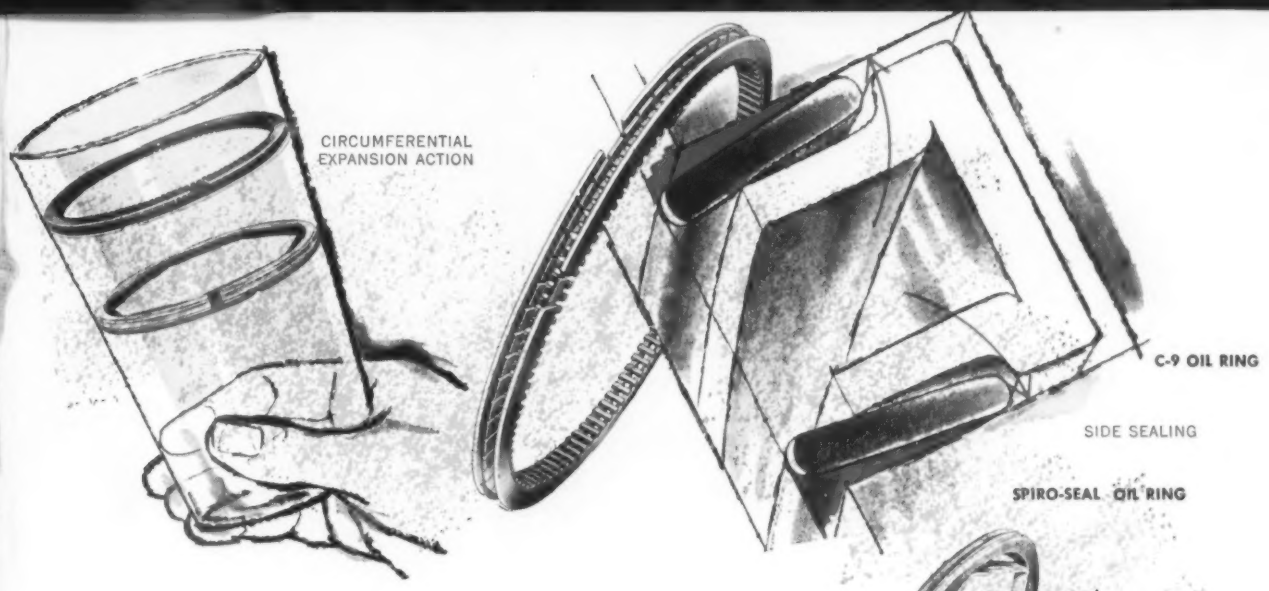
★ ★ ★

Too good service doesn't always pay. Take this sad story of a cab driver, for example. An order came over his radio to pick up a fare at a certain address. It so happened he was driving past the house as the call went out. The woman had just hung up the phone when he rang the doorbell. All the explaining in the world didn't convince the lady of the coincidence. She still insisted, "I wouldn't ride with anybody who drives as fast as you must," and slammed the door in his face.

★ ★ ★

Peter's December report card was not nearly so good as the last one. "What happened?" his father demanded. "Too much excitement over the holidays?"

"Well, you know how it is, dad," the boy explained in an injured tone, "everything's marked down after Christmas."



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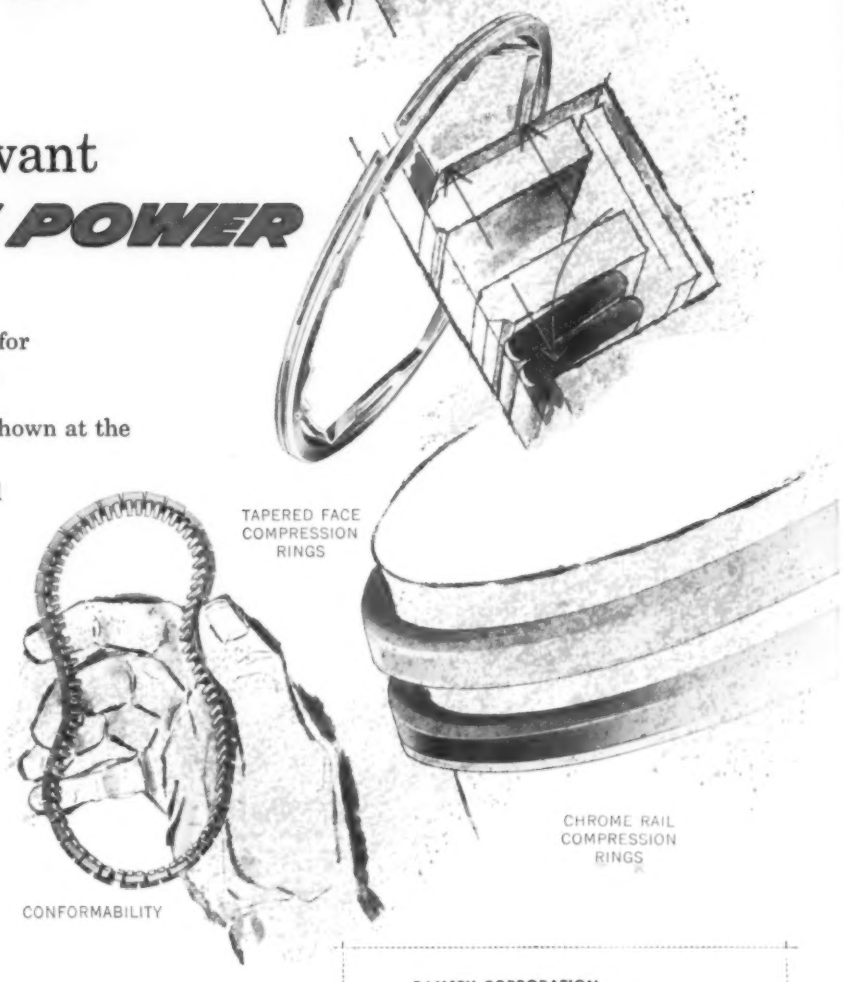

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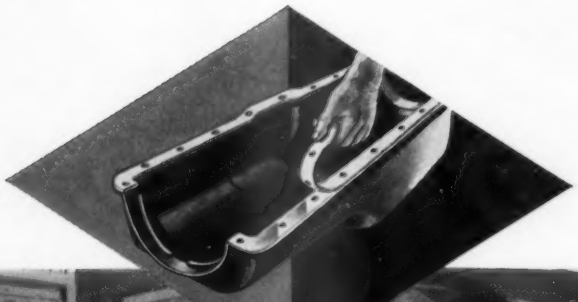

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